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Syme Memorial Lecture.¹

A SURGICAL QUEST.

By SIR HENRY SIMPSON NEWLAND,
Adelaide.

THERE are two facts in connexion with this the fifth Syme Memorial Lecture that are fresh. It is the first occasion on which it has been delivered while the Empire is at war, and it is the first time that a surgeon from another State has been the memorial lecturer. I should be less than human did I not greatly appreciate the special compliment which the Council of the Victorian Branch of the British Medical Association has paid me. It is not always easy to select a subject for a memorial lecture, and I was relieved, therefore, when your Council chose "War Surgery". I may add that had the choice rested with me, the outcome would have been the same.

It is over twenty years since I last had the honour of addressing this Branch, and on that occasion I was in one respect in a more fortunate position than I am today. I was able then to speak with personal experience of plastic surgery of the face in war. At the present time my knowledge of surgery in the present conflict has perforce been gained from the literature and from memoranda that have from time to time reached Australia.

In modern warfare efforts have been made and are still being made to protect the fighting man from the more lethal effects of missiles and gas and from the ravages of disease. There has been a revival of armour; witness the "tin hat".

¹ Delivered before a meeting of the Victorian Branch of the British Medical Association on April 2, 1941.

In the last war Kenneth Walker had a wandering commission on the Third Army front. In 1918 he noted the frequency with which men in the front line were being killed, almost instantaneously, by tiny splinters of grenade or shell entering the front of the chest and ripping open the heart or roots of the great blood vessels. "Such splinters", he wrote, "had a low penetrating power, and the presence of an article, such as a cigarette case or a New Testament, in the breast pocket of the soldier frequently led to miraculous escapes from death. The lucky ones to escape were but a fraction of those who died on the battlefield. Sauerbach has stated that out of 300 dead examined on the battlefield, 37% showed chest wounds, while Löffler records the slightly lower figure of 29%. Chest wounds form only 3% of the wounded admitted to the casualty clearing stations. These figures show that most chest wounds are immediately fatal."

With the object of protecting the vulnerable area, Kenneth Walker suggested to general headquarters "that stationary men, like front line sentries, should carry in a pocket at the back of the respirator a steel plate curved to the front of the chest". At the instance of Mr. Churchill, Kenneth Walker was recalled from France and attached to the Ministry of Munitions as expert in light armour. "In tank warfare the addition of a little extra weight to the soldier was no great drawback. Since the Great War, warfare has become vastly more mechanised, and the tensile power of steel has been immeasurably increased." As Kenneth Walker points out, if it is worth while protecting the head with the steel helmet, it is surely rational in the case of the more highly mechanized units to protect also equally vital areas, such as the chest and abdomen. The use of body armour by the Army of the United States of America is being considered. It weighs only fourteen pounds, and protects the whole of the abdomen and chest against shrapnel, hand grenades, revolvers, automatic pistols, and an indefinable percentage

of fragments of shell and bomb—that is, missiles up to a velocity of 1,200 feet a second. If resistance is sought against missiles of higher velocity discharged from a rifle or machine gun, the area of protection may be reduced and a couple of pounds added to the weight. Today materials are available with the same tensile strength as aluminium and about half its weight. They can be moulded to any shape, and the cost is reasonable. The Air Ministry is keenly interested in Kenneth Walker's proposals; but the War Office has administered a cold douche to him in the following words: "We are not interested in the subject." It is said that German shock troops are protected, and prior to the war three efforts were made to induce a certain inventor in the United States of America to place his armour at the disposal of the German staff. Kenneth Walker summarized his own conclusions as follows: "Just as in the factories and mines there is close collaboration between the medical profession and the managers to protect workers against illness and injury, so should there be a far closer collaboration than at present exists between the surgeons treating wounds and the military, naval and air forces. Only by a close study of the type of injury from which a particular branch of the service suffers can we evolve the necessary methods of preventing it." In his opinion the subject of protection was being ignored, owing to the lack of a single body competent to deal with the whole subject. After a full discussion, in which many surgeons took part, the Section of Surgery resolved that the Council of the Royal Society of Medicine be asked to consider the formation of a special committee, and that the cooperation of the Society be offered to the Government. The meeting was emphatically of the opinion that the physical protection of the members of the fighting forces could and should be improved by a closer collaboration between the medical profession and the appropriate technical experts of the Admiralty, War Office and Air Ministry.

Within its own special sphere medical science has contributed enormously to the physiological protection or immunity of the soldier from infections, medical and surgical. Of the surgical infections tetanus is an example. Inoculation with the toxoid has largely replaced the antitoxin of the last war. When hostilities commenced in France, over 90% of the troops in the forward area were fully protected against tetanus. Injection was voluntary, so that 100% of inoculated men could not be expected; moreover, some of those inoculated may not have responded adequately. For this reason it is most desirable that all wounded men should be injected with a single dose of 3,000 units of tetanus antitoxin, and those who have not been immunized should be given two subsequent doses of 3,000 units with an interval of a week. The severe fighting before the Dunkirk evacuation provided a good test. Many men arrived in Britain five or six days after having been wounded without having received their initial dose of antitoxin. Amongst the small percentage who were unprotected by active immunization, eight cases of tetanus were reported, while among the large proportion who had been actively immunized not a single case of tetanus developed.

Active immunization against gas gangrene has not advanced beyond the experimental stage. In the treatment of gas gangrene in the last war an antitoxin was introduced, but most surgeons found it unsatisfactory. In the present war the prophylaxis of gas gangrene depends on early surgical intervention and on chemotherapy. Antitoxin is now used only as an adjunct to surgery.

It is obvious to me that time and the strain on your forbearance would never permit of even a review of the whole of surgery in modern warfare. An incident, a very tragic incident, in Sir George Syme's active service overseas in the late Great War has furnished me with a motif for this address: "He got a poisoned finger from a spicule of bone when operating, and barely escaped with his life." Dr. Fetherston, who was the Director-General of Medical Services at the outbreak of the Great War, told the following story after the death of Sir George: "A few weeks after the outbreak of the Great War in August, 1914,

Australia was asked to raise hospitals proportionate to the combatant troops going forward. It was my duty to call for volunteers. The first morning the call was made, Syme volunteered unconditionally for any position he could fill—no question of rank or pay." The last sentence tells us in no uncertain way that Syme had courage and humility, attributes that should form part of the stuff of every surgeon. His humility was put to the test soon after his arrival in Egypt, when a man of his attainments was given charge of a venereal diseases and measles camp.¹ However, higher authority for once saw the error of its ways, and its early repentance resulted in Syme's being appointed surgical consultant on the hospital ship *Gascon*, which was present at the landing on Gallipoli. While he was operating on this ship his hand was infected. Colonel Fred Bird has told how shocked he was at Syme's appearance and at the condition of his hand when he met him at Alexandria: "Incisions too few, and those there would have been comic cuts if they had not been so tragic." When Syme was seen by General Fetherston later on in London he was an invalid with a septic arm and hand. The muscles were hard, stiff and matted, the fingers fixed and contracted. He feared that his days as a surgeon were over. His determination and perseverance ultimately overcame the disability. This attitude towards his crippled limb showed that, in addition to his many other sterling qualities, he had tenacity and strength of purpose, qualities invaluable in a surgeon.

The prevention and cure of septic infection of wounds have for centuries been a great surgical quest. Notable as the advances have been during the last eighty years, the end is not yet.

The history of war surgery is a story of one long battle fought by surgeons to overcome infection of wounds. The great French military surgeon Ambroise Paré, who may be regarded as the father of war surgery, used boiling oil as a liquid cautery to kill the poisons in the wound—the purpose, you will note, being identical with that of Lister in the application of chemical antiseptics to a wound. The tissues rebelled against the scalding oil, became inflamed and a torture to the wounded man. Ambroise Paré has related how one day a shortage of oil (there was, however, no rationing) led him to apply to wounds a paste composed of the white of eggs, oil of roses and turpentine. Misgivings that night as to the outcome of this novel experiment led him subsequently to confess that he "could not sleep at mine ease". Next morning, much to his relief, he found that his antiseptic paste had not induced inflammation of the wounds, which looked healthy. Moreover, the wounded men had slept well, if their surgeon had not. This experience led Paré thenceforth to refrain from the use of boiling oil. The invention of the ligature was, however, the greatest of Paré's achievements, for besides saving wounded from death from hæmorrhage, it was a great factor in preventing death from sepsis. The invention made it possible for surgeons to practise the principle in the treatment of all wounds that hæmostasis must be as perfect as possible. A collection of blood clot is ideal pabulum for bacteria to prey on. Baron Larrey, the great French surgeon of Napoleonic times, empirically and unconsciously applied the practice of decontamination on a massive scale to shattered limbs. He amputated them with an extraordinary measure of success. Doubtless he had observed that if the limbs were treated expectantly they became septic and gangrenous and there was a fatal termination. His practice of amputating was in effect a rude and radical equivalent of *débridement*. Now that plaster of Paris has been elevated to almost the dignity of an apotheosis, it is of interest to remember that it was Larrey who first recommended its use as a splint.

The guillotine amputation, which is the crudest method of removing a limb infected with gas gangrene, and which was for a time often performed in the Great War, has been the subject of recent controversy in the medical Press. I may say that I unreservedly range myself on

¹ Dr. B. Zwar assures me that Sir George Syme was never detailed for such duty.

the side of Ogilvie in his scathing condemnation of the operation. A circular cuff amputation, or an amputation with short anterior and posterior skin flaps based on a cuff of skin, takes little time to perform and allows ample drainage when the stump is loosely packed with gauze. In turning back the skin flaps in a circular amputation through the thigh or arm, I always include the deep fascia. The vitality of the skin is made more secure and there is less hæmorrhage. Division of the external and internal intermuscular septa makes the inclusion of the fascia quite easy.

A third, and the greatest, figure in the battle waged by surgeons to achieve victory over infection was Lister, under whom Sir George Syme and Hamilton Russell were privileged to study. His original efforts were directed to the prevention of air-borne and direct bacterial infection of wounds by the use of cleanliness, the carbolic spray and carbolic lotion. He thus effected a revolution in the treatment of wounds and in operative surgery. He showed that the best way to defeat infection was to prevent the bacterial invasion of wounds and to kill the organisms *in situ*, and he devised measures to that end. Koch advocated the use of corrosive sublimate and mercuric iodide as antiseptics in preference to carbolic acid. The search for a substance that would destroy the infecting organisms without damaging the tissues has gone on to the present day. In the Great War, pastes for war wounds, redolent of the days of Paré, were employed by Watson Cheyne, Lister's oldest disciple at King's College Hospital, and by Rutherford Morison, the inventor of "B.I.P.P." A great advance, unheralded at the time, was the excision of contaminated wounds, which was recommended by Friedrich, a German surgeon, who lived in the latter part of the last century. The method fell into oblivion, only to be rediscovered by the French Army surgeons early in the last war. *Débridement*, or excision of the wound, is now recognized to be the most important single factor in the prevention of the infection of a wound. But, with the advent of this simple yet rational procedure, surgeons still continued to drench wounds with antiseptics, such as a solution of salt, the oldest antiseptic in the world, or with hypochlorite solutions. The solutions introduced by Carrel and Dakin during the Great War were supposed to have the valuable property of killing any bacteria ensconced in the wound after excision, without at the same time causing damage to the tissues over which the fluids flowed. At the time the good results obtained were attributed mainly to the excision, but in a lesser degree to the antiseptic effect of the solutions and the special technique employed in introducing and distributing them in the wound. It is now realized that the real virtue of the Carrel-Dakin treatment of excised wounds lay not so much in the antiseptic solutions as in the gauze used to maintain the Carrel tubes in position in the excised wound, which it thus served to drain. In fact, the gauze in the Carrel technique, and the gauze in the salt pack advocated by Almroth Wright, played the same role as does the plain or "Vaseline" gauze used in the treatment of war wounds today according to the methods of Winnett Orr and Trueta. It was in 1923 that Winnett Orr, who had served as a surgeon in the Great War, commented adversely on the methods which had been employed in the treatment of gunshot wounds attended with fracture of the limbs. In compound fractures he advocated and carried out in civil practice the following measures: (i) immediate reduction on a traction table of the displaced fragments, all the injured parts being brought as nearly as possible into correct anatomical position; (ii) complete excision of the wound, enlargement being made, if necessary, to remove foreign material and dead and dying tissue; (iii) the insertion of a sterile, non-absorbent, non-irritating "Vaseline" pack into the depths of the wound and extending beyond its edges for about an inch, and the placing over all of a dry, sterile, absorbent cotton-wool dressing firmly bandaged in position; (iv) enclosure of the entire limb in a well-fitting plaster of Paris cast, with or without the incorporation of traction devices to ensure complete immobility; (v) infrequent dressings, the first being done four to six

weeks after the operation, unless the odour and amount of the discharge decreed otherwise.

The measures introduced by Winnett Orr embodied three important surgical principles: decontamination of the wound, drainage of the wound, immobilization of the limb. They were first put into practice in warfare by the Spanish surgeon Trueta at Barcelona during the civil war in Spain.

The first and most important principle, the decontamination of the wound before it became infected, was of course not new. Friedrich, as I have said, had advocated excision of a contaminated wound to a surgical world which heeded him not.

In the Great War it was learned that it was the combination of streptococci and anaerobes in wounds that proved so fatal. The one method of attack above all others that prevented infection by these organisms was early and complete removal of all contused, torn and contaminated tissues. It is imperative to realize that there is a period of respite between the moment of traumatic contamination and the onset of infection. If the wound can be operated on as soon as possible within six hours, there is every chance that it will escape infection and heal cleanly. "Antiseptics play no important part in the régime; the whole aim is to excise the wound before the organisms dig themselves in."

In Leriche's view, the question of primary suture after excision and the question whether the wound should be encased in plaster of Paris depend on the extent of damage to muscle. He holds that primary suture and the immediate application of a plaster cast, if performed under the best possible surgical conditions, is justified in many wounds involving bones, whereas a lacerated wound of the thigh or calf should be left open until the danger of sepsis has passed. He does not agree that the application of a plaster cast is the ideal method for all wounds of the soft parts. All deep wounds of muscle he would leave open; after fifty-four hours inspection may show that the wound is perfectly clean, and secondary suture can then be carried out. Leriche advises that *débridement* must be performed methodically and precisely in stages. Each stage must be complete before the next is carried out. Hæmostasis must be perfect, so that no blood clot is left in the wound. Wounds of the various organs present special problems in excision—for example, the brain, the lung and the abdomen.

The first stage is as follows. Two sets of gloves and instruments should be used, the first set being discarded after the initial process of "cleaning up" is finished. Liquid soap is used for cleaning, the soap is removed by thorough bathing with sterile water, and ether is then applied to remove grease. All this is carried out under general anaesthesia.

The second stage consists in the excision of the skin edges. The knife should be kept perpendicular to the surface, half to one centimetre being removed all round the wound, if possible in one piece. Skin should not be sacrificed unnecessarily and the knife should not be allowed to enter the depths of the wound. A knife with a keen edge and a surgeon with a keen and discerning eye are essential to high success in the technique of decontamination. No subcutaneous dead space must be left.

In the third stage the aponeurosis or deep fascia is removed with scissors or a fresh knife, a smooth, continuous edge being left. The removal of the skin and frayed fascia should be completed before deeper excision is attempted. If what has been done does not give easy access to the depths of the wound, it should be enlarged. In the excision of a wound blind work is bad work.

The fourth and last stage is the most difficult of performance. It involves the removal of damaged muscle and of any foreign bodies. It demands fine surgical judgement. All damaged or ischæmic tissue must be removed until the cut muscular surfaces ooze fresh blood. Muscle, unlike skin, does not regenerate, and it should not be sacrificed unnecessarily. The tissues enclosing a foreign body, and those through which it has passed, should be removed *en bloc*, with the same care as

a malignant tumour. A contaminated wound left contaminated may spell malignant sepsis. When important structures, such as vessels and nerves, lie in the depths of the wound, these must be inspected. Leriche insists that wounds should never be closed by primary suture if they involve large vessels, if they have gone through the middle of a deeply placed bone or if they have traversed the substance of a muscle where the surgeon can never be sure of satisfactory excision. "Safety first" is the slogan. Every stage in the extirpation of contaminated tissue should be carried out with precision under direct vision.

After the excision of the contaminated wound the second great principle of drainage is practised. For this purpose Winnett Orr uses "Vaseline" gauze; Trueta found that plain gauze of a fine mesh was just as effective. Ogilvie prefers gauze soaked in a 1 in 1,000 solution of proflavine. Strips of gauze, plain or medicated, are packed firmly and evenly into the wound and all its interstices. A dressing of wool is applied over the gauze pack and bandaged firmly.

It is now known that the sulphonamide compounds exert a local action in the wound and are slowly absorbed into the blood stream. A War Office memorandum recommends the packing of war wounds at the earliest moment, and particularly at the time of excision of the wound. The Japanese are said to carry a sulphonamide in the field dressing. The earlier the application is made, the more likely is prophylaxis to be successful.

The third and most important principle is absolute, not perfunctory, immobilization. This is carried out by the application of a plaster case to the limb. I have mentioned that wounds of the abdomen, brain and chest require special application of the principle of the removal of contaminated tissues. It is only to penetrating wounds of the chest that I have time to refer.¹

Concurrently with the political revolution in Spain, a revolution in the treatment of the wounds of warfare came to pass. The results of the treatment adopted by Trueta are probably familiar to you. It may be of some interest to refer to the impressions of the American surgeon Rudolph Matas, who visited Barcelona during the revolution and who consequently could speak with first-hand knowledge. He remained in the Catalonian war zone for over two months. He spoke the language fluently and had free access to all the hospitals. What he saw in the Catalonian war zone led him to admit that all his preconceived notions of the treatment of war wounds (derived chiefly from experience of the Great War) were completely upset. He had an opportunity of seeing several plaster encasements removed from lower limbs, on which they had been *in situ* for fifteen to twenty-one days after reduction, *débridement* and gauze drainage of a gunshot fracture of the femur. The stench that smelt to heaven was nauseating. "The smell", he said, "when plaster encasements are ripening is a shock to sensitive nostrils"; but he comforted himself with the reflection that "not all cheese that smells bad, is bad". "A magma or mush of decomposing pus, wound secretions, including sweat and other matter, covered the surface of the wound under the plaster." After wiping this off with warm water and soap, and after removal of the gauze packs, he was surprised to see the excellent, healthy, pink, well-granulated appearance of the wounds, coupled with a very satisfactory condition of the patients—no fever, no pain, and a good appetite. "This was indeed a revelation which I had not anticipated. Why no acute streptococcal infections, little or no tetanus or gas gangrene was indeed an extraordinary fact. Suffice it is to say that when fresh wounds are relieved of all dead and devitalized tissues and are put to complete rest, they are quite able to take care of themselves without the aid of antiseptics, which (when truly bactericidal) hinder the normal reproduction of the tissue cells and weaken their defences." Surgeons were at last recognizing, as Gamgee has put it, that "the great antiseptic is life. That the living tissues have a

natural preservative power, which if guarded and conserved by the surgeon on physiological principles, offers the surest guarantee for healthy repair, which is only an adaptation and extension of normal nutrition."

Matas concluded that in view of the attempts being made to keep germs out of wounds and out of the atmosphere, rude experience at the Spanish war front imposed by necessity seemed to discount the importance of germs, provided (i) that the living tissues were allowed to fight their own battle unencumbered by the bodies of dead or dying tissues, and kept undisturbed, and (ii) that the living tissues were kept undisturbed and protected in the process of repair and reproduction from "tempestuous manipulations and destructive germicidal irrigations" by absolute fixation in plaster casts.

This view of the role played by germs in excised wounds cannot be fully accepted, though in a general sense it is true. The Medical Research Council of the Privy Council in Great Britain has a research laboratory for streptococcal infections and has appointed a War Wounds Committee. The committee has received two reports on hospital infection of war wounds. Therein it is stated that there is good evidence, not only that hospital infection of war wounds occurs, and that ample reservoirs exist in the hospital environment, but that lapses in routine prophylaxis whereby pathogenic bacteria may enter a wound are not infrequent in surgical treatment. To the surgical patient the risk has been greatly reduced by the practice of antiseptics and asepsis and by the segregation of grossly infected patients. The evidence of infection from hospital environment is particularly strong in the case of hæmolytic streptococci. If streptococci appear in a wound after its handling by a person with a streptococcal sore throat, the incidence of hospital infection may be assumed with greater confidence if the two streptococci are found to be of the same type. The report quotes two cases, one tragic, of streptococcal infection. It is admitted that the case which ended fatally was most exceptional.

Two patients, Mrs. A. and Sergeant B., both uninfected, were operated upon on the same day and by the same team. The operations were the first and second on the morning of July 18, 1940, and were respectively for left cervical sympathectomy and repair of left brachial plexus. Four days later Sergeant B.'s incision suppurated and yielded a Type XI streptococcus. A shallow ulcer eventually formed, which healed early in September, or about six weeks after the date of the operation. Five days after operation, Mrs. A.'s incision broke down and the pus contained streptococcus Type XI. The patient's condition became rapidly worse and she died a few days later from secondary hæmorrhage from the subclavian artery.

Examination of throat swabs of all the operating theatre staff present on July 18 revealed that one nurse was an abundant carrier of streptococcus Type XI. It seems probable that she was the source of infection, because, although there were other patients with Type XI streptococcal infection in the hospital at the same time, there was no discoverable association between these and the two patients, and no other source of infection was evident. The masks used in the operating theatre were too small to reach under the chin, and consisted of two thicknesses of gauze with no interposed impervious material. The surgeon himself wore a large and impervious mask.

The researches led the committee to insist on the most meticulous practice of Listerism, in wards as well as in operating theatres.

The last weapon to be added to the armoury of the surgeon in the fight against infection is chemotherapy. Ehrlich's success in destroying the organism of syphilis had raised hopes that drugs lethal to other organisms might one day be discovered. That hope has been realized in the epoch-making discovery of the sulphonamides. Their action in combating an infection is believed to be bacteriostatic in nature. An hypothesis, recently published,² of the mechanism of the action of sulphonamide compounds supplies a theoretical framework upon which a complete scheme of sulphonamide chemotherapy may

¹ At this stage Sir Henry Newland showed a series of slides illustrating the operative surgery of wounds of the chest.

² John S. Lockwood: "Sulphonamide Therapy as an Aid to Surgery", *Surgery, Gynecology and Obstetrics*, February, 1941.

be constructed. Bacteria have to eat to live, but they cannot make direct use of large unsplit molecules of protein. "The protein molecules of the host must first be broken down into the simpler component amino-acids through the activity of a large number of enzymes, each enzyme being responsible for a certain link in the chemical chain of events. Failure of any one of the essential enzymes to perform its function properly will disrupt the entire mechanism of bacterial reproduction. It is here that the sulphonamide compounds produce their effects. These compounds bear a close resemblance to certain chemical substances which are essential to bacteria nutrition, of which one at least appears to be *p*-aminobenzoic acid. Molecules of a sulphonamide may prevent the proper coupling of *p*-aminobenzoic acid to the enzyme. The effect of this antagonism is to prevent bacterial utilization of *p*-aminobenzoic acid, with the result that the cell ceases to divide. Such interference with bacterial reproduction is termed bacteriostasis. If there are present on the bacterial surfaces a very large number of enzymes capable of using *p*-aminobenzoic acid, or if there is excess of *p*-aminobenzoic acid in the environment, the number of sulphonamide molecules required to block all of the enzymes and to stop bacterial growth altogether will necessarily be correspondingly great. The concentration of sulphonamide required for complete bacteriostasis may be greater than is actually supplied to the area through the physiological process of drug transport. However, if the molecules of sulphonamide greatly outnumber the molecules of *p*-aminobenzoic acid, the bacteria cease to multiply, their toxin production stops, and they will die either from starvation or by falling prey to phagocytic cells of the host. When this sequence takes place in the body the infection no longer spreads into new areas, the bacteria are destroyed and the patient recovers.

"*p*-aminobenzoic acid is one of a group of substances which act as inhibitors of sulphonamide bacteriostasis, and are essential to bacterial nutrition at some stage of their growth cycle. These substances, which lessen or prevent the valuable activities of the sulphonamides, are present in peptone and apparently in most of the digests produced by the action of enzymes on protein. Pus and necrotic tissue contain large amounts of these sulphonamide inhibitors, which are not released from the tissues until the "enzymatic degradation" of the tissue protein has taken place. Thus it happens that the bacteria which have the capacity of digesting tissue rapidly, such as the staphylococci, or other bacteria in pus or necrotic tissue, are richly supplied with sulphonamide inhibitor substances. These fortify the organisms against the concentrations of sulphonamide capable of attainment in the area of inflammation. The bacteriostatic efficiency peculiar to each sulphonamide compound, it has been suggested, depends on its power to overcome the sulphonamide inhibitors. For example, it takes five times as much *p*-aminobenzoic acid to inhibit sulphapyridine action *in vitro* as it takes to inhibit sulphanilamide." This hypothesis explains why it is necessary to maintain a uniform high level of sulphonamide in any case of infection and to obey at the right time the old surgical maxim: "*Ubi pus, ibi incisura*".

Many of you have probably noticed that so far I have omitted any reference to the mode of employment of the sulphonamides. That omission has been deliberate.

Subject as surgeons are to a manual infection such as befell Sir George Syme, it is strange that, so far as I know, nothing has ever been published specifically instructing surgeons how best to avoid infection of a wound received in the course of an operation on infected tissues. It may be that such instruction has been regarded as superfluous, every medical practitioner being deemed capable of healing himself. Whitby has recently filled the gap, and I make no apology for quoting at some length from his valuable paper. In the course of that quotation an excellent account is given of the method of administering the sulphonamides, applicable not only to infections of the hand like that of Sir George Adlington Syme, but also to the wounds of warfare.

I doubt whether it is correct, as Whitby asserts, that most medical men must at some time have thought what they would do were they to receive a wound when dealing with an obviously infected patient or when making a *post mortem* examination. Their attitude is generally not to worry about such a disagreeable happening until it really happens. "One of three things", Whitby states, "may happen as the result of such an injury. Firstly, the infecting organism may be inoculated directly into the blood stream, in which case, owing to the speed of the blood stream, no local measure, however quick, can prevent the dissemination. Secondly, the infecting organism may be inoculated into the tissue spaces, and either give rise to a local abscess or cause an ascending lymphangitis, which in due course may result in septicæmia. Thirdly, nothing may happen, either because no inoculation is made or because the organism is quickly overcome." Fortunately for the profession, kind Fate decrees, by far the most frequently, the third and happy termination. "As an immediate measure there is much to be said for the encouragement of free bleeding by the application of a light tourniquet, the free flowing blood being washed away under a tap." If no tourniquet is immediately available a similar constriction can be applied by the fingers of the other hand. "Caustics and strong antiseptics should be avoided, as these cause tissue necrosis, which encourages the growth of planted organisms. Iodine or acriflavine may be used, but the best dressing, if such are available, are either hypotonic saline or hypotonic magnesium sulphate or urea, all of which stimulate an outward flow of lymph. However busy a medical man may be, he is taking an unnecessary risk if he does not cease work at once and go to bed for at least 48 hours with the affected part immobilised." This in many cases is, I am afraid, a counsel of perfection. "He should, of course, remain in bed if there is the slightest evidence of local or general reaction at the end of this time. During the period in bed a prophylactic course of the appropriate sulphonamide drug should be taken in full dose, namely, one gramme four hourly night and day; and this should be continued unless everything appears well at the end of forty-eight hours. There is now considerable experimental evidence to show that packing a recent wound with 5 to 15 grammes of sulphanilamide holds up, and indeed may eliminate, an implanted infection. When there is a definite wound, local application should, therefore, be made, in addition to the oral course previously recommended. There is no point in removing a finger after a needle prick has resulted in blood stream implantation with multiplication, unless there is a persistent local focus. Lymphangitis and adenitis, too, are more often protective manifestations than signs calling for amputation. Most coccal foci of infection are better not incised until the pus is laudable. It is indeed a mistake to incise lesions which are in the stage of hyperæmia. It should also be borne in mind that the formation of an abscess sometimes serves to localize an infection and definitely to save life.

"When appropriate sera are available they may be used to supplement chemotherapeutic treatment. There is, as we have seen, considerable evidence that the sulphonamide group of drugs exercise their action by inducing bacteriostasis and that the final elimination of the infection requires the cooperation of the immunity mechanisms of the host. For this reason, therefore, small doses of the concentrated antitoxic sera of the streptococcus and staphylococcus should be used when there is much toxæmia. Should the infection of the surgeon's hand result in septicæmia, it is important to obtain an adequate concentration of the appropriate sulphonamide drug in the blood. When facilities are available, it is as well to check this point by a blood estimation a few hours after beginning treatment. The blood content should reach and be maintained at not less than 10 milligrammes *per centum*. If this level is not reached with an oral preparation, then subcutaneous, intramuscular or intravenous injection should be used as a supplement. The oral preparations serve for most purposes, and they have the advantage of being slowly and continuously absorbed over a period of time, thus maintaining an adequate blood level.

During administration fluid intake should be generous. Soluble preparations for injections of sulphanilamide itself (which is soluble in water to the extent of 1%) are more rapidly absorbed than oral preparations, but they are also excreted more rapidly. Numerous injections are therefore necessary if a soluble preparation is used as the sole method of treatment. Intravenous administration is only required in fulminating cases or neglected cases. Sulphanilamide is well tolerated when taken by the mouth, and is probably the compound of choice for empirical treatment of a suspected haemolytic streptococcal infection. A daily dose of one gramme per 20 pounds of body weight (maximum six grammes) should be given for the first two days in equally divided doses administered four hourly, day and night. After two days the total daily dose should be decreased by one gramme, and after a further two days the remainder of the course of ten days should be at the rate of three grammes per day. Sulphapyridine is the best drug for empirical use when the nature of the infecting organism is uncertain from the clinical aspect and cannot be proved by blood culture. In all cases it is advisable to powder the tablets and suspend the powder in milk. In this form the drug is usually well tolerated. Sulphathiazole may act on a strain of an organism when sulphapyridine has failed. Of the parenteral preparations, the most efficient and potent preparation is the soluble sodium salt of sulphapyridine, which is supplied in ampoules of three cubic centimetres, each containing one gramme. To avoid pain it must be injected deep into muscle. It can be injected intravenously if diluted with 20 cubic centimetres of saline. The dose of this preparation is one gramme, repeated not more than once in four hours."

Whitby warns against the tendency to rely on chemotherapy alone and of the danger attending this attitude. Sir Thomas Dunhill has noted such a tendency in the treatment of some of the wounded evacuated from Dunkirk. Lastly, "the greatest vigilance must be exercised to detect the presence of pus. No known sulphonamide compound will disperse it. Pus demands surgical treatment."

I hope you will agree that so lengthy a quotation from Whitby's paper has been justified. I trust that if Sir George's spirit be surveying this assembly from the second state sublime, it does so with approval. I myself feel that if but one life be saved as the result of what I have quoted, this fifth Syme Memorial Lecture will not have been given in vain.

Finally, the surgery of warfare and the surgery of peace-time have each much to gain from the other; and so it seems fitting to close this lecture with the lines from *Timon of Athens*:

Make war breed peace, make peace stint war; make each Prescribe to other, as each other's leech.

AUSTRALIAN BREAD: ITS VITAMIN B₁ CONTENT AND ITS IMPORTANCE IN THE AUSTRALIAN DIETARY.

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THE controversy which has raged during the last two decades around white bread and its nutritive value has received a considerable stimulus from the decision of the British Government to authorize the addition of synthetic vitamin B₁ (aneurin or thiamin) and calcium to white flour for breadmaking.

Naturally, Australians are seeking information about Australian bread and its nutritive value. This question will be reviewed in this paper by means of a discussion of several phases of the problem. The changes in flour which were brought about by the change from stone to roller mills will be considered, and then the contribution made by bread, particularly white bread, to the Australian dietary will be investigated. The relative vitamin B₁ content of the various special types of bread on the market will be considered.

The Change in the Nutritive Value of White Flour brought about by the Introduction of Roller Milling. Comparison between Stone-Ground and Roller-Milled White Flour.

From the beginning of civilization until nearly the end of the nineteenth century cereals had always been stone ground. At first the process was carried out between two hand-manipulated flat stones, as practised by the primitive Australian aboriginal, and finally by large power-driven stone mills.

From the fourteenth century at least the aristocracy of Europe ate "white flour" obtained by the sifting or "bolting" of the whole ground wheat through cloth. The finer the cloth, the less the yield of flour, but the whiter and the finer the product. During the eighteenth and nineteenth centuries it became a sign of financial and social eminence to eat "white" bread made from refined wholemeal flour. Thus it is that the preference of the general public for white bread is deeply rooted.

Towards the end of the last century the introduction of roller milling and the use of silk gauze for "bolting" the whole ground flour caused the production of a very white flour. The percentage extraction fell from 75% or 80% with stone grinding to about 70% or 73% with roller milling. This comparatively small change in extraction caused a pronounced deterioration in the nutritive value of white flour, as can be seen in Table I, which is taken from Drummond and Wilbraham.⁽¹⁾ Stone-ground "white" flour contained portions from all the constituents of the wheat berry except the outer bran. In addition, only a small part of the endosperm was not included in the flour. On the other hand, white flour made from roller mills is almost pure endosperm. The bran and germ centre are removed, and in addition 15% of the endosperm (mostly from the outer portions lying under the bran) is not included in modern straight-run flour, but is deflected to the pollard.

TABLE I. (After Drummond and Wilbraham.)
Comparison of Stone-ground and Roller-milled White Flour.

	Stone-ground White Flour per 100 Grammes.	Roller-milled Bleached White Flour per 100 Grammes.
Protein.. ..	12.5 grammes.	10.1 grammes.
Fat	1.4 grammes.	0.9 grammes.
Total minerals	1.1 grammes.	0.4 grammes.
Calcium	44.0 milligrammes.	20.0 milligrammes.
Phosphorus	180.0 milligrammes.	92.0 milligrammes.
Iron	3.3 milligrammes.	1.0 milligramme.
Carotene	0.2 milligramme.	Nil.
Riboflavin	0.02 milligramme.	0.01 milligramme.
Vitamin B ₁ (I.U.)	100.0	10 to 15

(The value given in this table for the vitamin B₁ content of roller-milled white flour is rather low. Moran and Drummond (1940)⁽²⁾ give 30 international units per 100 grammes¹ for the average English flour.)

Comparison between Modern Commercial Wholemeal and White Flour.

Through the courtesy of a large firm of millers in Australia we obtained samples of the following products: (a) mixed commercial wheat (first break wheat after scouring and conditioning); (b) almost 100% stone-ground wholemeal flour (about 0.5% of the product consisting of the coarser bran had been removed); (c) commercial wholemeal flour made from whole ground wheat, from which 5% of bran had been removed and to 35 parts of the resultant wholemeal flour 15 parts of white flour had been added; (d) commercial white flour. Products (b), (c) and (d) had all been made from the same sample of mixed commercial wheat. These products were analysed for certain constituents and the findings are given in Table II.

¹ Throughout the remainder of this paper the vitamin B₁ content of foodstuffs will be given in microgrammes (γ) per gramme. One international unit equals three microgrammes; one gramme equals 1,000,000 microgrammes.

TABLE II.
Comparison of Wheat and Wheat Products.

Substance.	Protein. (Percentage.)	Ash. (Percentage.)	Vitamin B ₁ . (Microgrammes per Gramme.)	Calcium. (Milligrammes per 100 Grammes.)	Phosphorus. (Milligrammes per 100 Grammes.)
First break wheat	—	—	5.4	37	181
Stone-ground wholemeal (0.5% bran removed)	11.0	1.31	5.1	37	178
Commercial wholemeal flour (5% bran removed; 15% white flour added)	10.8	0.85	4.3	29	140
Commercial white flour (71.4% extraction)	9.9	0.39	1.1	21	66 ¹

¹ These values for calcium and phosphorus are probably a little lower than the "average" Australian flour, as the ash content of all flour from this mill is below the average for Australian flours.

Protein was determined by the Kjeldahl method by means of the factor 5.7. Calcium and phosphorus were determined on the ash, calcium by the A.O.A.C.⁽⁶⁾ micro method and phosphorus by the method of Briggs.⁽⁶⁾ Vitamin B₁ was determined by the thiochrome method of Wang and Harris⁽⁶⁾ adapted for cereal products (Slater⁽⁶⁾).

The figures for the vitamin B₁ content of white flour as given in Table II are much below the average for Australian flour, for we found that the average vitamin B₁ content of Australian commercial white flour was 1.78γ per gramme (see Table V).

The results given in Table I demonstrate that "white" stone-ground flour was superior in calcium and vitamin B₁ content to roller-milled flour. Table II shows that modern commercial "wholemeal" flour (containing 15% white flour) is from three to four times richer in vitamin B₁ than white flour. The "wholemeal" flour contains more calcium than the white; but the calcium/phosphorus ratio of 1:4.8 is less satisfactory than the same ratio for white flour, which is 1:3.1.

The Place of Bread in the Australian Dietary.

The above comparisons have been concerned with flour; but in the Australian human dietary about 75% of the flour consumed is in the form of bread. Hence it is necessary to consider our investigation in terms of bread. In each pound of bread there are about two-thirds of a pound of flour; water forms almost the whole of the remainder. In this analysis bread will be considered as the equivalent of 67% flour.

The most comprehensive dietary survey so far made in Australia was that conducted by the Commonwealth Advisory Council on Nutrition, the findings of which were presented in the final report of the council.⁽⁷⁾ These findings will be used as the basis for this analysis. In his treatment of the domestic food records from 1,789 households, the statistician converted the mean daily intake of all foodstuffs from the household quantity to the amount per "adult male". The basis for the conversion of the household purchases to "adult male" figures was the family coefficient scale recommended by an expert committee of the League of Nations.⁽⁸⁾

The relative values for persons of different ages are given in Table III.

TABLE III.
Family Conversion Scale.

Ages in Years.	Coefficient.		
	Male.	Both Sexes	Female.
0 to 2	—	0.2	—
2 to 3	—	0.3	—
4 to 5	—	0.4	—
6 to 7	—	0.5	—
8 to 9	—	0.6	—
10 to 11	—	0.7	—
12 to 13	—	0.8	—
14 to 59	1.0	—	0.8
60 and over ..	—	0.8	—

In the survey the mean daily consumption of bread per "adult male" was found to be 10.4 ounces. This amount

contributed 820 Calories out of a total of 3,800, or about 21%.

The contributions to the dietary made by the principal constituents of white flour will now be considered in detail.

Protein.

Protein constitutes 10% of white flour, and a consumption of 10.4 ounces of bread per day would provide about 20 grammes of protein in a total daily consumption of 112 grammes, or 18%. A change to wholemeal bread would not appreciably increase the protein. Thus bread is not an important source of protein in the Australian dietary.

Fat.

The fat in bread contributes less than 4% of the total fat consumed in a day by an "adult male".

Calcium.

Table II shows that the calcium content of white flour is 21 milligrammes per 100 grammes, and that of wholemeal flour is 29 milligrammes. On the assumption that a man would eat the same quantity of wholemeal as of white bread, if eating either separately, the contribution made by each to the day's calcium intake would be as follows:

White bread used exclusively 41 milligrammes
Wholemeal bread used exclusively . . 56 milligrammes

Leitch⁽⁹⁾ considers that 0.55 gramme of calcium per day is required for maintenance of normal men and women. An analysis of the foods consumed by the households covered in the nutrition survey showed that the average daily intake of calcium was 0.59 gramme per adult male. The calcium contributed by each article of diet in the average diet to the total intake is given in Table IV, as shown in Table X, Section II, of the "Final Report of the Advisory Council on Nutrition".

TABLE IV.
Calcium Content of Each Group of Foodstuffs in the Average Group.

Foodstuff.	Calcium Intake per Adult Male per Day in Grammes.	
	White Bread.	Wholemeal Bread.
Bread	0.041	0.056
Cakes, flour, cereals ..	0.030	0.030
Meats	0.026	0.026
Milk	0.278	0.278
Cheese and eggs	0.080	0.080
Green vegetables	0.076	0.076
Fruit	0.040	0.040
Potatoes	0.023	0.023
Total	0.594	0.609
Total, milk eliminated	0.316	0.331

White bread contributed 6.9% of the total calcium intake. It will be observed that after milk and milk products, vegetables are the next most important source

of calcium, and in households where the consumption of these is small, the contribution of calcium made by bread to the total calcium intake becomes increasingly important.

If the same quantity of calcium were added to Australian flour for bread making as the British Government intends to add to British flour, the total intake of calcium per adult male would be raised to 0.71 gramme per day on the full diet, and the intake on a diet from which the milk was eliminated would be raised from 0.32 gramme to 0.44 gramme per day.

Phosphorus.

Phosphorus is very widely distributed in nature, being plentifully supplied in bread, meat *et cetera*. In ordinary circumstances a deficiency of phosphorus is not likely to occur. The calcium/phosphorus ratio is very important, and the greater the calcium content of a diet, the closer the ratio will be to the desirable figure of 1.0. Attention has already been drawn to the fact that the calcium/phosphorus ratio of white flour is more desirable than that for "wholemeal" flour.

Iron.

In a diet in which all the bread is of the white variety, 18% of the total iron intake would be supplied by the white bread. If wholemeal bread were substituted for white in the same diet it would contribute 40% of the total iron consumed. Free and Bing⁽¹⁰⁾ have shown that all the iron of bread is in a form available to man.

This brief review has shown that bread is a valuable source of energy, that in certain circumstances it can become a good source of calcium and that wholemeal bread is a very valuable source of iron, all of which is available.

Vitamin B Complex.

The only other important constituents of bread are the members of the vitamin B complex; these will be considered in detail. For a fuller understanding of the part played by members of the complex in this problem, the more recent work will be reviewed.

Up to the present time four members of the vitamin B complex have been shown to be necessary for human metabolism. They are: (i) vitamin B₁, or aneurin or thiamin; (ii) riboflavin or vitamin B₂; (iii) nicotinic acid; (iv) pyridoxin, or vitamin B₆. It has also been suggested that pantothenic acid is necessary.

Vitamin B₁, riboflavin and nicotinic acid all form derivatives which, when attached to specific proteins, become enzymes concerned in tissue oxidation. Vitamin B₁ pyrophosphate, known as coenzyme I, is a coenzyme essential for the oxidation of pyruvic acid to acetic acid.⁽¹¹⁾ Nicotinamide is a constituent of coenzyme I (cozymase)⁽¹²⁾ and coenzyme II.⁽¹³⁾ Coenzyme I is essential for the oxidation of lactic acid.⁽¹⁴⁾ The lactic acid is oxidized by reduction of the coenzyme, which in turn is reoxidized by an enzyme diaphorase, which contains riboflavin. The relation between these three members of the vitamin B complex has been well expressed by Bernheim:⁽¹⁵⁾

The oxidation of lactic acid thus needs a nicotinic acid derivative which in turn needs a riboflavin derivative, and the pyruvic acid formed from the lactic acid then requires thiamin for its oxidation.

Our knowledge of the action of pyridoxin and pantothenic acid has not advanced so far as that of the other members of the complex. But Spies and his co-workers⁽¹⁶⁾ have shown that a deficiency of pyridoxin in man caused a definite syndrome characterized by extreme nervousness, insomnia, irritability, abdominal pain, weakness and difficulty in walking. Spies *et alii*⁽¹⁷⁾ have also found a decreased pantothenic acid concentration in the blood of subjects suffering from a vitamin B complex deficiency, suggesting that pantothenic acid is also necessary for human nutrition. The members of the vitamin B complex are distributed widely in foods, but the highest concentration of vitamin B₁ is in the whole grain of the cereals. The vitamin B₁, riboflavin and nicotinic acid contents have been determined for a range of foodstuffs,

pantothenic acid and pyridoxin contents for but a few foods, and then perhaps imperfectly. Whilst chemical methods have been evolved which can evaluate the vitamin content of a foodstuff with an accuracy of 10% to 15%, the range of vitamin values in one food is much greater than the experimental error of determination. By way of example and because it relates to the question under discussion, we quote from a recent work by Slater and Rial⁽¹⁸⁾ on the vitamin B₁ content of Australian flour. This is one of the commonest household substances, and yet the vitamin B₁ value has a range of over 100% (Table V).

TABLE V.
The Range of Vitamin B₁ Values of White Flour.

Samples of Flour.	Vitamin B ₁ , Microgrammes per Gramme.
1. Retail, Canberra	1.25
2. Forbes, N.S.W.	1.41
3. Narrandera, N.S.W.	1.43
4. Port Adelaide, S.A.	1.47
5. Charlton, Victoria	1.50
6. Moonta, S.A.	1.55
7. Gunnedah, N.S.W.	1.64
8. Jamestown, S.A.	1.65
9. Mixed, N.S.W.	1.83
10. Nhill, Victoria	1.88
11. Sydney, N.S.W.	1.88
12. Horsham, Victoria	1.90
13. Kellerberrin, W.A.	1.90
14. Murray Bridge, S.A.	1.97
15. Warwick, Queensland	2.20
16. Perth, W.A.	2.27
17. Northam, W.A.	2.53

This range of vitamin values in the same type of foodstuff has been demonstrated frequently, and because of this it is almost impossible to determine accurately on paper the vitamin B₁ value of a given diet. The best that can be done is by means of averages to determine a theoretical average vitamin content.

This is quite valid for the comparison of diets with each other, for it is reasonable to assume that if one man eats twice as much of any foodstuff as another, on the average he should obtain twice as much vitamin B₁, if all other factors (for example, digestion and assimilation) are assumed to be equal. By adopting this procedure we have calculated the vitamin B₁, riboflavin and nicotinic acid value of the average (composite) Australian diet as revealed by the nutrition survey. This is given in Table VI.

TABLE VI.
The Average Vitamin B Complex Content of the Average Australian Diet.

Vitamin.	Daily Intake in Milligrammes.		A man weighing 10 stone; reputed daily requirement. (Bacharach and Drummond. ⁽¹⁹⁾)	
	With White Bread.	With Wholemeal Bread.	Marginal. (Milli- grammes.)	Optimal. (Milli- grammes.)
Vitamin B ₁ ..	1.34	1.97	1	3
Riboflavin ..	2.27	2.40	?	2
Nicotinic acid ..	16.0	?	?	10

For the calculation of the vitamin B₁ content of the average diet, certain vitamin values of foods were used:

1. The vitamin value of bread was calculated from the mean of the Australian flours (Slater and Rial⁽¹⁸⁾).
2. The vitamin value of cereals was taken as the mean of Pyke's⁽²⁰⁾ results for oatmeal and the Australian figures for flour.
3. For meat, eggs, fruit and vegetables we used the figures quoted by Moran and Booth,⁽²¹⁾ who stated that the results were on the generous side.
4. The figure for milk was obtained from a series of samples of Australian milk analysed by us, and agreed closely with the results obtained by Houston *et alii*⁽²²⁾ and Pyke.⁽²⁰⁾

5. For cakes, biscuits and flour a figure equal to one-half the value for white bread was taken. This allowed for the water content and destruction during cooking. We have analysed a number of different types of biscuits; the results are shown in Table VII.

TABLE VII
The Vitamin B₁ Content of Biscuits.

Type of Biscuit.	Vitamin B ₁ Microgrammes per Gramme.
Cream biscuit	0.38
Wheatmeal	0.72
Arrowroot	0.63
Plain biscuit ("Sao" type) ..	0.99

We have also determined the destruction of vitamin B₁ during the baking of a water scone with bicarbonate of soda and cream of tartar:

	Microgrammes per Gramme.
Vitamin B ₁ content of flour used ..	2.2
Vitamin B ₁ content of dried scone ..	1.56
Destruction of vitamin B ₁ = 29%.	

6. Allowance was made for destruction of vitamin B₁ during the cooking of meat and vegetables, as follows: (a) Mickelsen *et alii*⁽²⁰⁾ have shown that, in general, 50% of the vitamin B₁ in meat was destroyed in cooking; (b) Aughey and Daniels⁽²⁰⁾ demonstrated that 30% of the vitamin B₁ in vegetables was destroyed by the ordinary processes of cooking.

The figures for riboflavin are preferred values selected from the literature. The sources used were Fixsen and Roscoe⁽²⁰⁾ and Mickelsen *et alii*.⁽²⁰⁾ These values all refer to oversea figures, except for milk, which was taken from Hutchinson's determination on Australian milk.⁽²⁰⁾

Values are not available for the nicotinic acid content of the whole range of foodstuffs. Reliable figures for cereals have not been published; but biological tests (Sebrell⁽²⁰⁾) show that they are poor sources of this vitamin. The intake of nicotinic acid in the Australian diet has been calculated, no figures for cereals, fruit and vegetables being included.

Only a few figures are available for the pyridoxin content of foods, but cereals appear to be a very good source of this vitamin, which is distributed throughout the grain (Chick⁽²⁰⁾). Its presence has been demonstrated in starches of cereal origin, even when they have been highly purified.

Very little information exists on the pantothenic acid content of foods.

For future reference we append in Table VIII the vitamin values of foods as used in these calculations.

Table IX shows the percentage distribution of each vitamin of the complex in the principal food groups. Of the members of the vitamin B complex for which reliable values are available for the distribution in foods, vitamin B₁ is the only one supplied in any quantity by bread. The amount in Australian white bread is such that an average intake of 10.4 ounces daily provides nearly one-third of the total daily intake. If all wholemeal bread of average vitamin content is substituted for white bread, it provides more than 50% of the vitamin B₁ intake.

These findings are contrary to the belief held by many that white bread is almost devoid of vitamin B₁. Such erroneous ideas are traceable to the confusion which exists about the distribution of vitamin B₁ in the wheat grain. Because the wheat germ had been found to be very rich in vitamin B₁ per unit weight (about 25 microgrammes per gramme) it was concluded that most, if not all, the vitamin B₁ of the berry was concentrated in the germ.

Recent work (Schultz *et alii*,⁽²⁰⁾ Slater and Rial⁽²⁰⁾) has shown that the vitamin B₁ in the average wheat germ is not more than 7% of the total vitamin B₁ in the whole grain. The latter authors suggest that a very large

TABLE VIII.
Vitamin Content of Foodstuffs.

Foodstuff.	Mean Weekly Consumption in Pounds per Adult Male. ¹	Vitamin B ₁ (Milli- grammes per Pound.) ²	Riboflavin. (Milli- grammes per Pound.)	Nicotinic Acid. (Milli- grammes per Pound.)
Bread (white) ..	4.68	0.56	0.18	Low
Cereals ..	0.7	1.04	0.27	Low
Cakes, biscuits and flour ..	1.18	0.28	0.27	Low
Beef ..	1.77	0.27	0.80	
Pork ..	0.12	1.02	1.04	
Mutton ..	1.19	0.41	1.44	
Veal ..	0.18	0.27	1.08	
Ham and bacon ..	0.12	1.02	1.08	
Smallgoods ..	0.13	0.17	2.25	
Rabbits ..	0.20	0.17	0.9	
Poultry ..	0.03	0.17	0.63	
Canned meats ..	0.01	0.17	0.9	
Fish, fresh and canned ..	0.37	0.17	1.35	
Milk ..	8.17	0.158	0.76	2.1
Cheese ..	0.10	0.14	0.76	?
Eggs ..	0.55	1.36	2.02	2.3
Fresh fruit ..	3.11	0.19	0.18	?
Potatoes and root crops ..	3.92	0.24	0.22	?
Green vegetables ..	3.15	0.24	0.27	?
Sugar and sweets	1.50	Nil	Nil	Nil

¹ From the "Final Report of Advisory Council on Nutrition"; figures for New South Wales only.

² Allowance has been made for cooking.

TABLE IX.
Distribution of Intake of Vitamin B Complex in Principal Food Groups.

Foodstuffs.	Vitamin B ₁ .		Riboflavin. (Percentage.)	Nicotinic Acid.
	With White Bread. (Percentage.)	With Wholemeal Bread. (Percentage.)		
Bread ..	28	51	5	Low
Cereals, cakes, bis- cuits and flour ..	11	8	3	Low
Meat ..	15	10	30	84
Milk ..	14	9	40	15
Cheese and eggs ..	8	6	8	1
Fruit and vegetables	24	17	14	No value
	100	101	100	

percentage of the vitamin B₁ is concentrated in the layers of the endosperm just beneath the bran. Most of this endosperm remains in the pollard, but some goes to the flour. This is the explanation of the presence of vitamin B₁ in white flour. The closer the milling is carried to the bran, the higher will be the vitamin B₁ content of the resultant white flour. This is illustrated by Table X.

TABLE X.
Vitamin B₁ Content of A, B and C Reduction Flour and Straight Run Flour.

Flour.	Vitamin B ₁ Microgrammes per Gramme.
A. Reduction flour	0.67
B. Reduction flour	0.59
C. Reduction flour	0.70
Normal straight run flour	1.51

The samples of A, B and C types of reduction flour came from an early stage in the milling of the wheat, and would contain a greater proportion of flour from the centre of the endosperm than would the straight run flour. A, B and C types of reduction flour together constituted a patent flour representing 44% of the normal flour.

At this stage we are in a position to conclude that Australian white flour contains appreciable quantities of vitamin B_1 , ranging from 1.25 to 2.53 microgrammes per gramme. The actual quantity in any specimen of flour depends upon the vitamin B_1 content of the wheat and also upon variations in milling technique. One sample of flour examined retained 13% of the vitamin B_1 in the wheat from which the flour was milled, while another sample retained 29%.

It has further been shown that in the average (composite) Australian diet nearly one-third of the vitamin B_1 is supplied by the white bread eaten.

The preceding analysis and discussion have been based on the average food consumed by 1,789 Australian households. Reference to the "Final Report of the Advisory Council on Nutrition"⁽¹⁾ shows that the composite diet, the average of all Australian families surveyed, was balanced and adequate. It is quite possible that whilst the vitamin B_1 intake may be adequate in those families whose consumption of foodstuffs is equal to or above the average dietary, it may not be so in those families whose consumption of the protective foods is below the average figure.

For information on this question we consulted the original diet sheets prepared from the domestic food record books of the nutrition survey. Orr⁽²⁾ has shown that the consumption of bread, in general, bears a direct relationship to the income; the higher the income, the less bread consumed. Two groups of families were selected from the 1,789 families who had taken part in the survey. Group I (68 families, 3.8% of the total) comprised those families in which 25% or less of the total Calories consumed came from bread and cereals. Many of these families were in the higher income sections of the community. Group II (52 families, 2.9% of the total) comprised those families in which 45% or more of the total Calories consumed came from bread and cereals.

The vitamin B_1 content of each diet was calculated by means of the vitamin values for the various food groups shown in Table VIII. The results could have been assessed on the absolute vitamin value of each diet or group; but it was decided to apply a formula evolved by Williams and Spies.⁽³⁾ After the analysis of many diets these workers came to the conclusion that the ratio of vitamin B_1 intake (in microgrammes) to the non-fat Calories gave the best indication of the vitamin B_1 content of a diet. When this ratio had been determined for each diet in our series, the mean was calculated for each group. The results were as follows:

The "average" diet	0.54
Group I	0.53 \pm 0.0084
Group II	0.48 \pm 0.0065

The difference between Groups I and II is statistically significant. In Group II the consumption of bread was more than twice as great as in Group I and was achieved at the expense of sugar, for in Group I 14% of the total Calories came from sugar, whilst in Group II sugar provided 8%.

Table XI shows that in the Group II diets bread is the principal source of vitamin B_1 , whilst in Group I the protective foods, milk, eggs and fruit and vegetables, are the most important sources.

TABLE XI.

The Percentage of Vitamin B_1 Contributed by the Various Foods in the Three Groups of Diets.

Foodstuffs.	Average Diet. (Percentage.)	Group I. (Percentage.)	Group II. (Percentage.)
Bread	28	20	46
Cereals, cakes, biscuits and flour	11	8	12
Meat	15	15	11
Milk	14	19	9
Eggs	8	10	6
Fruit and vegetables	24	28	17

Earlier we had admitted the impracticability of attempts to determine whether the average diet contained optimal amounts of vitamin B_1 . It is now revealed that diets containing more than average quantities of bread contain relatively less vitamin B_1 than that contained in the "average" diet. There is no information to indicate that this reduced vitamin B_1 intake in relation to the amount of non-fat Calories consumed condemns the diet as inadequate or even suboptimal; but the findings do emphasize the fact that if the diet of any section of the community is likely to be deficient in vitamin B_1 , it will be that in which relatively large quantities of bread are consumed to the exclusion of the protective foods.

The results for Group I are most unexpected, for we had confidently anticipated that the average ratio of this group would have been greater than 0.54. The families on this type of diet took a restricted bread intake, substituting a greater intake of the protective foods as the alternative source of vitamin B_1 and a higher intake of sugar and other poor vitamin-bearing carbohydrates (sweets) as the alternative source of Calories.

These findings prompted us to investigate the vitamin B_1 non-fat Calorie ratio of the foodstuffs consumed. These ratios are given in Table XII.

TABLE XII.
Ratio of Vitamin B_1 to Non-fat Calories.

Food Group.	Non-fat Calories per Pound. (i)	Vitamin B_1 , Microgrammes per Pound. (ii)	Ratio (ii) : (i).
White bread	1,158	561	0.48
Cereals	1,520	1,040	0.68
Sugar	1,857	0	0.0
Biscuits (see Table VII)	1,353	308	0.23
Beef	306	271	0.89
Mutton	278	407	1.5
Fish	360	170	0.47
Pork	356	1,020	2.9
Milk	153	158	1.0
Eggs	224	1,360	6.1
Potatoes	485	238	0.49
Other vegetables	177	238	1.3
Fresh fruits	231	190	0.82

With the lowest ratio for staple foods equal to 0.48, it is obvious that all sections of the community obtain a high percentage of their Calories from foodstuffs containing little or no vitamin B_1 . Reference to the findings of the nutrition survey shows that in the "average" diet 25% of the total Calories were supplied by cakes, biscuits, sugar and sweets. The greater the consumption of this class of foodstuff, the lower will be the ratio of vitamin B_1 to non-fat Calories in the diet, and hence the more unsatisfactory from the nutritional aspect.

This ratio can be brought to a more satisfactory level by the substitution of bread, even white bread, for the foodstuffs containing less vitamin. In other words, sections of the Australian community could with improvement to their dietary eat more bread. Unfortunately this idea embodies an attempt to retrace the evolution of food habits and is full of difficulties. Today Australians consume more sugar *per capita* than any other peoples, a consumption that increased greatly over the last century, and there is nothing in the trend of food habits to suggest that it will diminish in the future. If this high consumption of carbohydrates of low vitamin content is going to be maintained, then it would appear that extra vitamin B_1 will have to be provided in some form. Ways in which this is being attempted with respect to bread will be considered in the next section of this paper.

In conclusion, it can be stated that diets with both a high and a low consumption of bread have a less satisfactory vitamin B_1 content than the "average" Australian diet. In the case of the former, this deficiency is due to a reduced consumption of the protective foods. In Group I diets a high consumption of the bulky protective foods has replaced some bread, and the extra energy required has been obtained by a much higher consumption of the carbohydrates low in vitamin content.

The Vitamin B₁ Content of Bread other than Plain White Bread.

Wholemeal Bread.

The vitamin content of wholemeal bread depends entirely on the type of flour used. Bakers emphatically state that in order to bake a loaf of good appearance and eating quality, the maximum percentage of wholemeal flour that they can use is 92%; very little bread is made with this high percentage. The average wholemeal flour of commerce contains from 12% to 15% of white flour mixed with it when it leaves the mill. Most bakers when making wholemeal dough add further quantities of white flour, so that many types of so-called wholemeal bread contain from 20% to 30% of white flour.

The analysis of wholemeal loaves showed that the vitamin B₁ content varied considerably from the calculated value, owing no doubt to the unknown quantity of white flour mixed with the original wholemeal.

The substitution of wholemeal bread¹ with an average vitamin B₁ content of 3.3 microgrammes per gramme for white bread with an average content of 1.24 microgrammes per gramme would raise the vitamin B₁ content of the "average" Australian diet from 1.34 milligrammes per day to 1.97 milligrammes. The vitamin B₁-non-fat Calorie ratio would be likewise raised from 0.54 to 0.79.

McDougall, in her bread survey of Europe,⁽²⁾ recounted a very striking story from Switzerland. In order to sell the local rye crops the Government authorized the manufacture of a wholemeal loaf containing four-fifths wheat and one-fifth rye, the degree of extraction being 82% to 85%. The bread was five to ten centimes cheaper than white bread. In the first month after its introduction the consumption of this special bread reached 65% of the total bread consumed, but fell away to 16.5% nine months later, and to 11% at the end of the year.

The people are at liberty to select white or wholemeal bread, and for many years nutritional experts have advocated the use of wholemeal bread instead of white bread; yet the Australian public has never responded. A conservative estimate today is that 90% of all bread eaten is white.

It is apparent from all sources that the people do not like wholemeal bread.

Any programme to increase the vitamin B₁ intake of large sections of the community by the extensive use of wholemeal bread will introduce many difficulties, not the least of which will be a great reduction of supplies of wheat offal for poultry and stock feeding.

Whilst it may be desirable from the nutritional aspect to increase the consumption of wholemeal bread, it appears to be impossible of achievement in reality.

Bread with Yeast of High Vitamin Value.

The average baker uses 0.75% of yeast in making white bread. Our analysis of six types of Australian yeast showed the vitamin B₁ content to vary from 6.7 to 16.2 microgrammes per gramme, with a mean of 12.3. Thus the contribution of vitamin B₁ made to the bread by yeast is only about 5%. Bread containing 3% yeast would contain 1.26 milligrammes of vitamin B₁ per two-pound loaf, instead of 1.12 milligrammes as for bread containing 0.75% yeast.

In both Great Britain and the United States of America a yeast of very high vitamin content has been produced. We understand that one type of American yeast contains 220 microgrammes per gramme. Dawson⁽³⁾ states that when yeast of high vitamin content is used in normal amounts—that is, two and a half pounds per 280-pound sack (or a little less than 1%)—a white loaf is produced with a vitamin B₁ content equal to that of wholemeal bread. Schultz *et alii*,⁽⁴⁾ in an actual determination, have shown that white bread made with yeast of high vitamin content contained 3.75 microgrammes per gramme of

¹ The value for wholemeal bread used here is a calculated one, the average values for wheat and white flour being used. It has been assumed that 80% wholemeal flour is used in making this loaf. It is possible to make these calculations because no vitamin B₁ is destroyed in baking.⁽⁵⁾⁽⁶⁾

vitamin B₁, and this was equal to their determination of vitamin B₁ in wholemeal bread. If production of this yeast of high vitamin content is possible in Australia at a reasonable cost, it provides a solution to the question of how to raise the vitamin B₁ content of the Australian diet.

Types of Australian yeast so far examined by us do not contain anything like the quantity of vitamin B₁ reputed to be present in English and American high-vitamin yeast, and at the present time (March, 1941) it is impossible to make in Australia white bread of high vitamin B₁ content by using yeast of high vitamin value.

Germ Flour Bread.

A number of manufacturers both here and abroad have seized upon the statement that the wheat germ is very rich in vitamin B₁ and have prepared from the germ a flour which is added to white flour for bread making. As has been shown earlier in this paper, the wheat germ is particularly rich in vitamin B₁ per unit of weight, but contains on the average less than 7% of the total amount of vitamin B₁ in the original wheat berry.

The germ also contains an oil and a number of enzymes; the latter, by acting on the oil, produce rancidity in the germ flour after a period of storage unless it is processed in some way. A number of methods for processing germ and germ flour are in use at the present time. In Australia heating is the principal method used.

At least two firms are making specially treated wheat germ preparations and wheat germ flour. We have analysed these preparations for vitamin B₁, with the following results:

"A" wheat germ flour .. 13 microgrammes per gramme
"B" wheat germ flour .. 24 microgrammes per gramme

The difference between "A" and "B" germ flours is due to the fact that in the processing 50% of the vitamin B₁ is destroyed in the former and 14% in the latter.

The firm making "A" recommends the addition of 10% of the germ flour to white flour; the firm making "B" advises the addition of 6%. The loaves made from these two types of wheat germ flour are creamy white in colour. If these types of germ flour were added to Australian white flour in the proportions indicated by the manufacturing firms, the resultant bread would contain the quantity of vitamin B₁ shown in Table XIII.

TABLE XIII.
The Vitamin B₁ Content of Wheat Germ Bread.

Vitamin B ₁ Content of the White Flour.	Vitamin B ₁ Content of a Two-pound Loaf of Bread. (Milligrammes.)		
	White Flour Only.	White Flour and 10% "A" Germ Flour.	White Flour and 6% "B" Germ Flour.
Low, 1.25 microgrammes per gramme	0.76	1.46	1.57
Average, 1.78 microgrammes per gramme	1.08	1.74	1.87
High, 2.53 microgrammes per gramme	1.54	2.15	2.29

¹ The values in this table were obtained by calculation, the small contribution made by the yeast being neglected.

A loaf of bread made with "A" germ flour was found by analysis to contain 1.8 milligrammes of vitamin B₁ per two-pound loaf, whilst a loaf made with "B" germ flour contained 1.9 milligrammes per two-pound loaf.

The interesting feature of Table XIII is that the addition of germ flour to white flour of low vitamin potency produces a loaf with a vitamin B₁ strength about equal to that made from plain white flour of high vitamin content.

A daily consumption of 10.4 ounces of white bread fortified with germ flour (6% or 10%) would provide 0.59 milligramme of vitamin B₁, against 0.36 milligramme from the same amount of white bread, and would elevate the daily average intake of vitamin B₁ from 1.34 milligrammes to 1.57 milligrammes.

Bread fortified with germ flour costs one penny per two-pound loaf more than white bread. In this respect it defeats one of the main arguments for its introduction. Earlier it was demonstrated that amongst low-wage groups, in which the consumption of bread is high, some extra source of vitamin B₁ might subsequently be found to be necessary. To burden these people with an extra penny per loaf for fortified bread would increase their financial difficulties.

Whilst the fortification of white bread with from 6% to 10% of germ flour may be desirable and even practicable for individual consumption, it would be impossible to introduce it on a national basis. The wheat germ is 1.5% of the wheat berry, but not more than one-fifth of this is recoverable in the milling process. To fortify 1,000 tons of white flour, at least 60 tons of wheat germ flour would be required, and to obtain this amount it would be necessary to mill nearly 20,000 tons of wheat. On a national scale this is impossible.

White Bread Made from Flour Fortified with Synthetic Vitamin B₁.

The fortification of flour with synthetic vitamin B₁ is the method advocated by the British Government. It is apparently intended to add about 1.6 microgrammes of synthetic vitamin B₁ to each gramme of flour. From figures quoted by Moran and Drummond,⁽⁶⁾ it appears that the average vitamin B₁ content of British white flour is 0.9 microgramme per gramme. Thus the resultant fortified flour will have a vitamin B₁ content of about 2.5 microgrammes per gramme. A two-pound loaf of bread made from this flour would contain about 1.5 milligrammes of vitamin B₁, and would supply a man who ate 10.4 ounces of bread with 0.49 milligramme of vitamin B₁. If bread of this vitamin potency was substituted for average Australian white bread, the total daily intake of vitamin B₁ would be raised from 1.34 milligrammes per day to 1.48 milligrammes.

An enterprising American firm has placed on the market a flour preparation to which has been added synthetic vitamin B₁, as well as other chemical substances. The manufacturers claim that if 0.5% of this preparation is added to flour for bread making, the resultant loaf will contain vitamin B₁ equivalent to that in a whole-wheat loaf. As yet (March, 1941) bread fortified with this preparation has not been marketed in Australia, so we are unable to quote its retail price.

In England the miller will add the synthetic vitamin B₁ to the flour. This method would be subject to greater accuracy, would yield a more uniform product and would be easier to control. The principle of the addition of vitamin concentrates by the baker is open to many obvious criticisms.

The National Health and Medical Research Council of Australia,⁽⁶⁾ at its ninth session in November, 1940, adopted and endorsed a resolution of its Nutrition Committee, which read as follows:

This committee is of the opinion that the addition of synthetic vitamin B₁ alone to white flour involves a wrong principle. It is well known that there are many instances where mixtures occurring in natural products have a more beneficial effect than the administration of the isolated single substances. An example is seen in the treatment of pellagra, where it has been found that, whereas the primary deficiency is nicotinic acid, the best results are obtained by the administration of additional members of the vitamin B complex. There is no evidence that vitamin B₁ produces its complete nutritional effect by its own unaided physiological action . . .

The addition of synthetic vitamin B₁ is contrary to this considered opinion of the Nutrition Committee. The ideal method of fortifying bread, and thus the whole diet, with vitamin B₁, would be to retain large quantities of the vitamin originally present in the wheat berry and at the same time remove all those portions of the berry which are objectionable to the average palate. In Table V it will be observed that at least three types of Australian flour have a vitamin B₁ content equal to or very close to that of the fortified British flour. If it is possible to

achieve this result with some types of flour, it should be possible to do it in at least a high percentage.

Here, it appears, is a solution of the problem, and it is being investigated at the present time.

Summary.

1. It has been shown that commercial wholemeal flour is three to four times richer in vitamin B₁ than white flour, but that the calcium/phosphorus ratio is less satisfactory.

2. The mean daily consumption of white bread per "adult male" in the households covered by the Australian nutrition survey was 10.4 ounces per day.

3. It has been shown that bread is a valuable source of energy and contributes some calcium to the daily intake.

4. Australian flour contains from 1.25 to 2.53 microgrammes per gramme of vitamin B₁. The actual content in any specimen of flour depends upon variations in milling technique as well as upon the vitamin B₁ content of the wheat.

5. Of the members of the vitamin B complex for which reliable values are available for the distribution in foods, vitamin B₁ is the only one supplied in any quantity by bread.

6. Diets with both a high and a low consumption of bread have a less satisfactory vitamin B₁ content than the "average" Australian diet. In the case of the former this deficiency is due to a reduced consumption of the protective foods. In the latter diets a high consumption of the bulky protective foods has replaced some bread, and the extra energy required has been obtained by a much higher consumption of the carbohydrates low in vitamin content.

7. An increased consumption of wholemeal bread may be desired from the nutritional aspect. The people are at liberty to select white or wholemeal bread, and for many years nutritional experts have advocated the use of wholemeal bread instead of white bread; yet the Australian public has never responded. A conservative estimate today is that 90% of all bread eaten is white. It is apparent that the people do not like wholemeal bread.

8. The contribution of vitamin B₁ made by yeast to the average type of bread is only about 5%. However, in Great Britain and the United States of America yeast of very high vitamin B₁ content is being produced. The use of this yeast in normal concentration in white bread would produce a loaf with a vitamin B₁ content equal to that of wholemeal bread. At the present time yeast of this type is not produced in Australia.

9. Bread containing 6% and 10% of wheat germ is available on the Australian market. These types of bread contain 67% more vitamin B₁ than is present in average white bread. This is in contrast to wholemeal bread, which contains 177% more vitamin B₁ than white bread. Bread fortified with wheat germ costs one penny per two-pound loaf more than white bread. Because 20 times more wheat would be required to fortify white flour with 6% wheat germ than the wheat milled to produce the flour, the use of flour fortified with wheat germ is impossible on a national scale.

10. In England, synthetic vitamin B₁ will be added to white flour for bread-making, and the resultant loaf will have a vitamin B₁ content about equal to half that present in Australian wholemeal bread. The addition of synthetic vitamin B₁ alone is contrary to the considered opinion of the Nutrition Committee of the National Health and Medical Research Council of Australia.

11. The ideal method of fortifying bread with vitamin B₁ would be to retain large quantities of the vitamin originally present in the wheat berry and at the same time to remove all those portions of the berry which are objectionable to the average palate. It has apparently been possible to do this in some types of flour in Australia. In our opinion this method will solve the problem of the fortification of the Australian diet with vitamin B₁, if this is deemed necessary.

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X-RAY EXAMINATION IN RECENT HEAD INJURIES.

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WITH regard to the indications for X-ray examination of patients who have recently sustained head injuries, we find differences of opinion between surgeons. Some surgeons fear that the movement and disturbance caused by an X-ray examination may rather do harm to the patient than give useful information concerning treatment. Other surgeons demand X-ray pictures in every case of recent head injury. Their points of interest are the following: (i) Are there large hematomata inside the cranial cavity? (ii) Are foreign bodies present? (iii) Are depressed fragments of the skull to be seen? (iv) Are there fractures entering the walls of a pneumatic space in the cranial capsule?

The presence of a large intracranial hematoma may be suspected, if a fracture is seen passing through the main branches of the middle meningeal grooves on one or both sides of the skull. The diagnosis of an extensive hemorrhage inside the cranial cavity can be made, if a displacement of the pineal shadow is present. The shadow of the calcified pineal gland is normally seen in most instances (after the second decade of life) lying in the median sagittal line and a horizontal plane passing parallel to Reid's base line (along the lower border of the orbit and the upper border of the external auditory meatus), four or five centimetres above Reid's base line. On the other hand, the frontal plane of the shadow lies 0.5 to 1.0 centimetre behind the vertical plane passing through the centres of the external auditory canals.

In some places contrast methods are used for the diagnosis of intracranial hematomata—either encephalography with air or cerebral arteriography by means of an injection of "Thorotrast" into the internal carotid artery in the neck. The first method reveals a displacement of the ventricles of the brain, the second method a displacement of the anterior or middle cerebral arteries or non-filling of these arteries due to obstruction, compression or rupture of the vessels.

Intracranial foreign bodies demonstrable by X rays are as a rule bullets or other metallic objects; there are occasionally also non-metallic foreign bodies like stones (slate pencil) or glass. Another foreign body not rarely seen inside the cranial cavity is air, which has penetrated through a fracture of the walls of air-containing cranial cavities, the paranasal sinuses, the naso-pharyngeal cavity or the middle ear spaces. In these cases sometimes collections of air may also be seen outside the skull, either as small, round, transparent spots in the subcutaneous tissues, mostly in the eyelids, corresponding to an emphysema, or as larger areas underneath the periosteum over the frontal sinuses or mastoids ("external pneumatocele"). The appearance of intracranial collections of air ("pneumocephalus") is similar to the well-known encephalographic pictures; air is seen in the subdural cavity, in the arachnoidal spaces, in the ventricles or in cystic cavitations of the brain substance.

Depressed fragments of the cranial bones in cases of compound, comminuted, blunt, sharp or penetrating head injuries (injuries caused by a hammer, a stone, a cricket ball or a bullet) are as a rule easily visible in the X-ray pictures. Their localization with regard to the contents of the cranial cavity can usually be made without difficulty.

The question whether a fracture is present passing through the walls of a pneumatic space of the cranial capsule can be answered positively, if the localization of the fracture in two different views corresponds to the same air space and if this air space is blurred, owing to the replacement of air by blood. It is not always possible to differentiate between a hæmo-sinus and a previous inflammatory condition or the shadow due to the swelling of the superimposed soft tissues. The blurring of the pneumatic space may render indistinct the fracture line of its walls.

With regard to the technique of the X-ray examination in recent cases of head injury, it is generally accepted that only a few general views in standardized positions are practicable. Four views give the best and quickest information: (i) the antero-posterior straight view, the principal ray passing along Reid's base line; (ii) the antero-posterior oblique (Towne's) position, the principal ray passing through the bregma and the line going through the centres of the external auditory canals; (iii) the right lateral oblique position, the principal ray passing through the left parietal protuberance and the right external meatus; (iv) the left lateral oblique position, the principal ray passing through the right parietal protuberance and the left external auditory canal.

The two pairs of views are as a rule sufficient to show whether a dislocation of the pineal shadow is present and whether foreign bodies, depressed fragments or fracture-lines are present and where they are localized. All four views can if necessary be taken with the patient's head in one position—that which is most comfortable for him, for example, the supine position.

If the patient is not too restless or if his general condition is not too bad, some special views can be added; for example, tangential views of the cranial vault at a place where depressed fragments are suspected, or stereoscopic views for the localization of foreign bodies. Vertical views, the vertico-submental and the submento-vertical view of the skull, are not advisable as the position of the patient that is necessary for the taking of vertical views is uncomfortable and even dangerous for him; moreover, these views rarely demonstrate fractures of the base of the skull, for which purpose they are taken.

The visibility of plain fissures on the X-ray pictures depends in the first place on the direction of the principal ray in relation to the slit of the fracture. As a rule the fissures of the forehead and the occiput are best seen in antero-posterior views, the fractures of the temporo-parietal regions on the lateral views. Depressed fragments are best seen on tangential views, the chief ray passing through a plane which lies tangentially to the surface of the vault, at a place where the swelling of the soft tissues indicates the presence of the fracture. On these tangential views the depressed fragments appear as double outlined shadows lying parallel or oblique to the double outlined projection of the cranial wall. The defect of the cranial capsule caused by the depression of fragments may not be seen distinctly, as the neighbouring parts of the skull are superimposed on it. Views with the central ray passing perpendicularly to the defect may not show the defect at all, not even the fragments, as the defect and the fragments may be superimposed in this view. Sometimes denser lines are seen corresponding to the superimposition of the fragments and the cranial wall.

Difficulties may arise in the differentiation of fractures from normal anatomical details of the skull, especially (i) plain fissures from sutures or vascular grooves and (ii) depressed fragments from normal irregularities on the inner or outer surface of the skull. With regard to the sutures we should remember that some of the great sutures, especially the sagittal and the lambdoid, the coronal and the frontal sutures, though they represent zig-zag outlines on the outer plate, form straight lines

on the inner plate. These straight lines imitate traumatic fissures. Also some of the smaller sutures may be similar to fissures, as they produce a straight-line appearance, especially the short parieto-mastoid suture and the suture between the squamous portion of the temporal bone and the greater wing of the sphenoid. An atypical suture separating the upper occipital squama from the lower on one or both sides, the so-called *sutura mendosa*, seen not very rarely in children, may look like a fracture line. There exists a peculiar variation in the occipito-parietal region, characterized by a shell-like prominence of the occipital squama over the parietal bones along the lambdoid suture. This congenital and inherited deformity (bathrocephaly) is often mistaken for a traumatic displacement of the parietal bones, especially on X-ray pictures taken in the lateral position, whereas the antero-posterior views show the bilateral symmetrical appearance of the peculiar configuration in a very convincing manner.

If a suture is separated by a fracture it may be difficult to recognize the presence of the fracture. A method is available which may help in these cases as well as generally for differentiation between fractures and normal anatomical details. The method consists in the inspection of the surfaces of a dry film by reflected light. Looking on the film of a skull by reflected light, we see darker and lighter areas, the lighter areas corresponding to dense bone, the darker to air-containing spaces, to vascular grooves and to suture lines. Still darker appear slits of fractures. The reasons for the differences in the dark colours are that vascular grooves of the skull are nearly always covered by a layer of bone and that the slits of sutures penetrate mostly through only a part of the thickness of the cranial capsule as mentioned above, whereas the great majority of fractures of the skull penetrate the whole thickness of the cranial wall. These facts explain the old experience that the colour of a fracture line is darker on the film seen by transparent light. The difference is still more striking with reflected light.¹ Another advantage of the method is that fracture lines can easily be differentiated from black lines caused by artefacts, as these are visible by reflected light only on one side of a double-coated film.

Summary.

In the preceding discussion the main indication for X-ray examination in recent head injuries has been cited, the technique of examination has been described and some advice has been given for the differentiation between fractures and normal anatomical details of the skull; in particular a new method has been recommended of diagnosing fractures by inspection of the films in reflected light.

Acknowledgements.

I am indebted to Dr. John O'Sullivan and Dr. Leo King for permission to use the outstanding collection of X-ray pictures in their department. I am also indebted to Dr. N. B. Lewis and Mr. E. Merton for their advice and assistance.

AGGLUTININS FOR TYPHOID AND PARATYPHOID BACILLI IN SERUM IN SOUTH AUSTRALIA.

By NANCY ATKINSON, M.Sc.,

From the Institute of Medical and Veterinary Science, Adelaide, South Australia.

THE object of this work was to determine the level of "normal" agglutinins for *Bacterium typhosum*, *Bacterium paratyphosum A* and *Bacterium paratyphosum B* in this community. Because of the routine "T.A.B." inoculation of men in the military forces, many inoculated persons

¹ The phenomenon has been explained to me in a very convincing manner by Dr. N. B. Lewis, of the research department, Kodak, Limited, Melbourne. Mr. E. Merton, of the technical advisory service, Kodak, Limited, Melbourne, has made photographic reproductions of X-ray films showing fractures of the skull by reflected light.

were encountered among those tested. The results of tests with serum from these persons are also included. Their histories were obtained when possible. The majority of the specimens of serum tested had been sent in for the Wassermann test, but when used in the present work had not been inactivated. Serum from a group of healthy subjects was obtained from volunteers for the blood transfusion service.

Technical Methods.

Agglutination tests were performed in the usual manner with serum dilutions commencing at 1/20. H and O suspensions of *Bacterium typhosum*, *Bacterium paratyphosum A* and *Bacterium paratyphosum B* were tested. The H suspensions consisted of formalized broth cultures (*Bacterium paratyphosum B* in the specific phase); the O suspension of *Bacterium paratyphosum A* was prepared in alcohol by Bien's method; the O suspensions of *Bacterium typhosum* and *Bacterium paratyphosum B* were formalized broth cultures of non-motile variants as used in the Oxford standard suspensions. The suspensions were compared with these standards and used only if their agglutinability factor was 1.0. A *Bacterium paratyphosum A* O standard was not available.

Results.

When a serum had a titre of 1/80 or over for any suspension, an attempt was made to obtain a history of the patient. This was possible in only a few cases. Many specimens, however, contained H agglutinins for the three enteric organisms. As a previous "T.A.B." inoculation was the most likely cause, these specimens were excluded from the "normal" group. Sixty-two of the 462 specimens tested contained the three H agglutinins; 13 of these came from subjects who had been inoculated with "T.A.B." Histories could not be obtained concerning the others.

Thus there were 400 specimens of serum from presumably uninoculated persons, and Table I shows the titres of these specimens.

From the results in Table I the percentage of specimens showing agglutination at the various dilutions has been calculated and these figures are given in Table II.

Thus the commonest agglutinins were those for the

typhoid bacillus. Six per centum of the specimens agglutinated the H suspension at 1/40, 2.5% at 1/80, and 1.5% at 1/160. A smaller number of positive results was obtained with the O suspension in the upper dilutions, only 1.0% at 1/80 and 0.3% at 1/160. Therefore in normal serum an H titre of 1/80 or 1/160 was more common than such an O titre.

Agglutinins for the paratyphoid organisms in serum dilutions greater than 1/40 were uncommon; the greatest number of positive results was obtained with *Bacterium paratyphosum B* H.

Ninety-six of the 400 specimens of serum tested gave a positive reaction; but only 20 contained more than one type of agglutinin; three of these specimens contained three types of agglutinins and the remaining 17 contained two. The commonest combination of agglutinins was *Bacterium typhosum* H and *Bacterium paratyphosum B* H. This occurred five times. A combination of *Bacterium typhosum* O and *Bacterium paratyphosum B* H occurred three times; *Bacterium typhosum* H and O occurred together twice, as did *Bacterium typhosum* H and *Bacterium paratyphosum A* H. Other combinations were each found only once.

There were 58 specimens of serum from members of the blood transfusion service, among whom were 14 soldiers who had been inoculated with "T.A.B." about 1917. Residual agglutinins were present in all these specimens. Four of the remaining 44 specimens gave positive results, one with titres of 1/40 and 1/20 with *Bacterium typhosum* H and O respectively, one with a titre of 1/40 for *Bacterium typhosum* H, and two with titres of 1/20 and 1/40 respectively for *Bacterium typhosum* O. No paratyphoid agglutinins were present.

In the inoculated group of subjects 29 had recently received injections in the Army, nine as inmates of an institution and 14 in 1916 or 1917. In the first two groups the usual reaction was observed, the H titres for the three organisms being high and the O titres low, especially for *Bacterium paratyphosum A* and *B*. There was a large individual variation in the titres. In the group of old soldiers a variety of combinations of agglutinins were present. The H agglutinins for all organisms had survived very well, and at least two were present in every specimen,

TABLE I.

Suspension.	Number of Specimens of Serum out of 400 Examined Agglutinating at a Dilution of:				
	1/20	1/40	1/80	1/160	1/320
<i>Bacterium typhosum</i> H	38	24	10	6	1
<i>Bacterium typhosum</i> O	44	21	4	1	0
<i>Bacterium paratyphosum A</i> H	5	3	3	1	0
<i>Bacterium paratyphosum A</i> O	3	2	0	0	0
<i>Bacterium paratyphosum B</i> H	23	7	2	1	0
<i>Bacterium paratyphosum B</i> O	8	2	2	1	0

TABLE II.

Suspension.	Percentage of Specimens of Serum Agglutinating at a Dilution of:				
	1/20	1/40	1/80	1/160	1/320
<i>Bacterium typhosum</i> H	9.5	6.0	2.5	1.5	0.3
<i>Bacterium typhosum</i> O	11.0	5.3	1.0	0.3	0.0
<i>Bacterium paratyphosum A</i> H	1.3	0.8	0.8	0.3	0.0
<i>Bacterium paratyphosum A</i> O	0.8	0.5	0.0	0.0	0.0
<i>Bacterium paratyphosum B</i> H	5.8	1.8	0.5	0.3	0.0
<i>Bacterium paratyphosum B</i> O	2.0	0.5	0.5	0.3	0.0

with titres of 1/80 to 1/160. Agglutinins for *Bacterium typhosum* O were present in four of the specimens to a titre of 1/20 to 1/40; with *Bacterium paratyphosum* B O only one specimen gave a titre of 1/20, and no agglutinins for *Bacterium paratyphosum* A O were detected.

Discussion.

Typhoid fever is endemic in this State, but paratyphoid fever is practically unknown. If the view is accepted that normal agglutinins are produced by contact with the specific organism, it would therefore be expected that such agglutinins for *Bacterium typhosum* would occur more frequently than those for the paratyphoid organisms which are absent from the environment. The results obtained with specimens of serum from presumably uninoculated persons bear out this expectation. In five cases positive results with *Bacterium paratyphosum* B H were associated with a positive result to a test with *Bacterium typhosum* H. The presence of the two H agglutinins suggested that these subjects had been inoculated, but unfortunately no histories could be obtained. Either infection or inoculation may have accounted also for some of the positive results to tests with *Bacterium typhosum* H, as agglutinins for this suspension were accompanied in four cases by agglutinins for either *Bacterium typhosum* O or *Bacterium paratyphosum* A H. In many specimens, however, these H agglutinins were the only ones present, and on this account they are difficult to explain as coming from infection with *Bacterium typhosum*, as under these conditions some O antibody would also be produced.

Compared with investigations carried out in Victoria⁽¹⁾ and in England⁽²⁾ the results given here indicate a smaller number of positive results to tests with *Bacterium typhosum* O and especially with *Bacterium paratyphosum* B O; results with the other suspensions agree fairly well with those recorded in the other localities. In the interpretation of the Widal test in this State a titre of 1/160 or more with *Bacterium typhosum* H or 1/80 or more with *Bacterium typhosum* O would be suggestive of infection, as such a result is unlikely to be found with normal serum. A titre of 1/80 or more with *Bacterium paratyphosum* B H or of 1/40 or more with the other paratyphoid suspensions would also be suggestive of infection, as these titres were rarely found in normal individuals. It is assumed, of course, that the patient has no history of enteric fever or of "T.A.B." inoculation.

With serum from inoculated persons the H titres for the three organisms were high and the O titres low, particularly for the paratyphoid bacilli. This is the usual result with "T.A.B." inoculation. In the group in which inoculation had taken place in 1916 to 1917, *Bacterium typhosum* H was agglutinated by most of the specimens of serum, the highest titre being 1/80; a few specimens agglutinated the O suspension to 1/20 or 1/40. None of the specimens of serum agglutinated the O suspensions of the paratyphoid organisms, while the H suspensions were agglutinated by many of the specimens. It is evident, therefore, that the H agglutinins produced by "T.A.B." inoculation last over a long period of years, but the O agglutinins are more transient.

Summary.

Four hundred specimens of serum from presumably uninoculated persons were tested against H and O suspensions of *Bacterium typhosum*, *Bacterium paratyphosum* A and *Bacterium paratyphosum* B. At a dilution of 1/80 2.5% of the specimens contained agglutinins for *Bacterium typhosum* H; but agglutinins for the other suspensions were present at this dilution in less than 1% of the specimens.

Sixty-two specimens of serum from inoculated persons showed relatively high H titres and low O titres. In recently inoculated subjects the three H agglutinins were present; but in persons inoculated many years ago only one or two of the H agglutinins still remained, and the O agglutinins had practically disappeared.

References.

- ⁽¹⁾ T. S. Gregory and N. Atkinson: "An Investigation of the Normal Agglutinins for Typhoid and Paratyphoid Bacilli in Human Sera in Victoria, and the Interpretation of the Widal Test", *The Journal of Hygiene*, Volume XXXVIII, 1938, page 566.
- ⁽²⁾ M. M. Smith, M. H. McVie and E. Newbold: "An Investigation into the Agglutinating Power of Human Sera for *Bacillus typhosus* and Various Allied Organisms", *The Journal of Hygiene*, Volume XXX, 1930, page 55.

USEFUL METHODS IN THE TREATMENT OF FRACTURES BELOW THE KNEE.

By C. CRAIG, M.D., M.S., F.R.A.C.S.,
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THE following methods have been found useful in the treatment of fractures below the knee.

Reduction.

Reduction of fractures of the shafts of both bones or of fracture-dislocations of the ankle is often difficult. To overcome this difficulty methods are often suggested which consist of piercing the bones with pins and using screw traction. Obviously these methods can be used only in the most favourable circumstances. By the method about to be described very powerful and prolonged traction can be applied without any special apparatus.

After a thick pad of cotton wool has been applied a clove hitch is placed round the ankle. A long strong bandage is suitable. One of the long ends is taken round the instep and looped under the bandage on the opposite side of the ankle. This is one of the usual methods of applying a traction bandage to the ankle. Any other method is suitable. It is essential, however, that there should be two long bandage ends coming away from the traction loop. The knee is now bent to right angles and supported in the usual way in this position. The surgeon now stands close to the foot and loops and ties the long bandage ends around his body. A support is placed on the ground against which a foot is braced. Traction is then applied by allowing the body to lean backwards. By this method a very strong and steady pull can be applied and can be maintained without fatigue for as long as is necessary to reduce the fracture. One of the merits of the method is that while the body applies the traction the hands are free to manipulate the fracture.

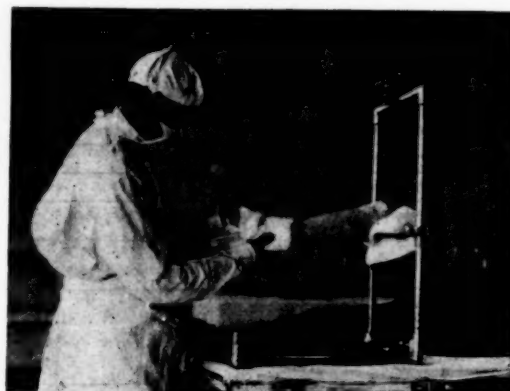


FIGURE I.

The Pillow Splint.

The pillow splint, an extremely useful splint, was introduced to Australia by Hamilton Russell, though it is doubtful if he invented it. The splint consists essentially of a long pillow extending from the upper third of the thigh to a few inches below the foot. It is placed round

the leg and secured in position by three separate pieces of bandage, one above the knee, one below the knee, and the other around the ankle. If the fracture is a Pott's fracture, the heel can be supported by a long piece of bandage used for the ankle tie, and after the knot over the front of the ankle has been tied the long ends are looped round the part of the pillow beneath the heel and tied there. The ordinary household pillow is not suitable and a special one has to be made. It should measure 40 inches in length and is 25 inches wide at the thigh end and 20 inches wide at the foot end. It is only about one and a half inches thick. The filling is put in loosely and is secured in position by stitching. Such a pillow is very light and easily packed. It can be placed under the seat of a motor car or tied to the back of a seat in an aeroplane. Six such pillows could be packed with six Thomas's splints without taking up any extra room.

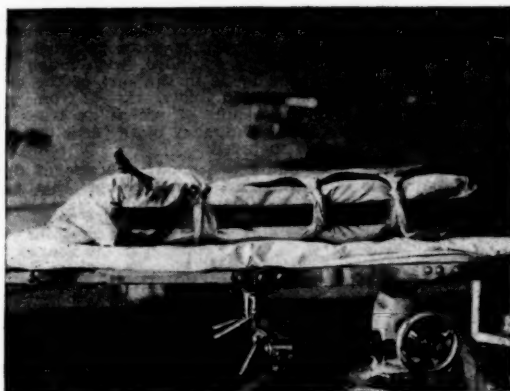


FIGURE II.

The splint is greatly improved by the use of two side clines. These are as long as the splint and are included in the bandages. The use of these clines was suggested to Hamilton Russell by Dr. Bain Drake, now of Huonville, Tasmania, when he was resident medical officer at the Children's Hospital, Melbourne.

The great use of the pillow splint is for first-aid work and for temporary use in the ward. As a first-aid splint it stands head and shoulders over every other splint for fractures below the knee, as it can be applied in a few minutes and gives no trouble during transport. An attempt was made to have this splint made in the same way as the beach "Lilow", so that it could be folded into a small space and blown up when required. One commercial firm was interested; but owing to war conditions the attempt to manufacture the splint was not successful.

Reports of Cases.

THE INFLUENCE OF A DIET RICH IN IRON AND VITAMINS UPON INTRACTABLE ULCERATIVE KERATITIS IN YOUNG CHILDREN.

By ARTHUR D'OMBRAIN,
Newcastle, New South Wales.

DURING 1940 a somewhat dramatic improvement in three cases of intractable ulcerative keratitis in children under the age of five years, and in 1941 a similar improvement in one case, was obtained upon the administration of a diet of high iron and vitamin content.

These four children, whilst difficult to label as suffering from this or that form of keratitis or corneal ulceration, presented certain features in common, and in all cases the lesion pursued an almost parallel course under treatment.

One symptom common to all four children was intense photophobia, so that the first made me think of the photophobia of erythredema (pink disease); it was this conception which made me turn eventually to the subject of diet. The photophobia was extreme, the children lying prone all day with their faces buried in the pillow.

The ulcers themselves, all unilateral, were similar in the first three cases, being irregularly shaped flat areas faintly staining with fluorescein in parts. The areas were not much vascularized (except in the fourth case, which will be considered separately), and while they may have been atypical phlyctenular ulcers, they were certainly not typical ones. Moreover, the children showed no obvious signs or symptoms of gross malnutrition.

Routine treatment with argyrol, atropine, "Metaphen", merthiolate, mercurochrome and hot fomentations had not the slightest effect, either before or after the patients' admission to hospital; the areas of ulcerative keratitis continued to spread, the distress of the little patients being pitiful to see. However, in each case orthodox treatment was tried for a while despite the success of diet in the first case, as it was difficult to believe at first that a special diet could be so rapidly decisive a factor in the treatment.

Newcastle Hospital, where all the children were eventually treated, is fortunate in the possession of qualified dietitians, and when it was decided in the first case to try a diet of high vitamin content, a properly balanced dietary was immediately available. The actual diet used is given in the appendix.

The results were amazing. In the first three cases within forty-eight hours and in the fourth case within four days the photophobia and lachrymation had almost disappeared; the children were sitting up in bed, wide-eyed and playing with their books and toys. Within a week from the commencement of the diet rich in iron and vitamins the children were discharged from hospital. The use of atropine was continued for a while, to be on the safe side; but none of the children relapsed. Instructions as to the value of a balanced diet, in which the use of green vegetables, raw carrot and fruit juices was stressed, were given to the parents.

Case IV.

A fair-haired female child, aged three and a half years, pretty, well formed and seemingly well nourished, had the photophobia common to the others; but the ulceration was of the type that would be unhesitatingly labelled a serpiginous (Mooren's) ulcer in an elderly adult. When the child was first seen in the out-patient department she was with difficulty examined and the cornea was stained with fluorescein. This demonstrated the presence of extensive marginal ulceration. Next week, as no improvement had followed the use of atropine and argyrol, she was admitted to hospital, and in three days' time she was examined under general anaesthesia. There was an advancing line of ulceration; this was thoroughly carbolized. No improvement occurred, and five days later she was given a diet rich in vitamins. Two days later she was again examined in the operating theatre; the ulcer was worse, presenting all the appearances of a creeping Mooren's ulcer, with a vascularized non-staining base and a staining line of advance almost from top to bottom of the cornea. Again the staining edge was carbolized and arrangements were made for zinc ionization in a few days' time. A bad prognosis was given to the parents.

But two days later in this seemingly hopeless case all symptoms had disappeared. A week later the child was discharged from hospital, cured, the opacified area stopping short of the pupillary line by one millimetre.

Conclusion.

Which vitamin or vitamins were responsible, I do not know. This has been "shotgun" prescribing, it is admitted; but the cases were desperate ones, and the only objective was the clinical one of arrest of the disease. Perhaps others can inform me.

Acknowledgements.

Thanks are due to the dietitians, Miss Anderson and Miss Christie (1940) and Miss Davies and Miss Stevens (1941), for their careful supervision of the dietary, and also to the nursing staff of the children's wards, Newcastle Hospital.

Appendix.

Diet Rich in Iron and Vitamins.

Include daily:

Glandular meat (kidney, liver or sweetbreads), one serving.
Meat, fish or fowl, one serving.
Eggs, one.

Potato, one serving (preferably baked in jacket).
Vegetables, three servings (one raw plus one green leafy).
Fruits, two servings (emphasize dried fruit).
Wholegrain cereal, one serving.
Butter, four tablespoons.
Citrus fruit or juice, one serving.
Milk, two cups (four cups for children).
Bread, cereals, cream, desserts, sugar and other foods required to maintain body weight.
"Marmite", one teaspoon.

Diet Outline.

Breakfast.	Dinner.	Tea.
Fruit juice.	Meat.	Glandular meat.
Porridge.	Potato.	Vegetables.
Egg.	Vegetables.	Fruit.
Toast.	Fruit.	Bread.
Butter.	Dessert.	Butter.
Tea.	Bread.	Milk.
Milk.	Butter.	
Sugar.	Milk.	

The raw vegetables used were finely shredded carrots, spinach and cabbage. One teaspoon of one of these three was given each day with dinner. Lettuce (one serving) was given each day as well.

Reviews.

PREVENTION OF COMMUNICABLE DISEASES
IN SCHOOLS.

We have received a copy of the tenth edition (1940) of a publication which first appeared in 1885, entitled "A Code of Rules for the Prevention of Communicable Diseases in Schools", issued by the Medical Officers of Schools Association, London.¹

This useful booklet deals briefly with the problem of infectious diseases in schools, first by consideration of the general principles of school hygiene and then in more detail by review of each infectious disease under the following headings: (a) Infectious Agent, (b) Source of Infection, (c) Mode of Transmission, (d) Incubation Period, (e) Period of Communicability, (f) Methods of Control.

The importance of influenza, colds and sore throats is rightly stressed and the immediate exclusion of all such sufferers is advocated.

It is interesting to compare the periods of exclusion from school with those laid down by the Department of Public Instruction of New South Wales. In pertussis, for example, New South Wales regulations exclude patients until the "whoop" has ceased, and contacts who have not had pertussis are excluded for three weeks; the London code permits return of any fully convalescent child after four weeks from the onset of the catarrhal stage, or sooner if proved free from infection by bacteriological examination; any child with cough or catarrh is isolated immediately.

In scarlet fever, exclusion in New South Wales is for a minimum of six weeks, as against four weeks, provided the child is well and there is no sore throat, aural or nasal discharge, suppurating or recently enlarged glands or eczematous patches.

Included in the final pages of the code is a useful summary of recent progress in the diagnosis of and immunization against diphtheria, scarlet fever, whooping cough and measles.

FOOD AND DIETETICS.

ALWAYS a valuable work of reference for the basic facts on which the science of nutrition is based, Hutchison's "Food and the Principles of Dietetics" has, in its ninth edition, enjoyed a transformation which, as those responsible

for its revision point out, has brought it more into the category of a text-book than of an encyclopædia.¹ The change is indeed welcome, in that it has led to the introduction of many of the newer ideas on nutrition which dominate this field today. Stress is laid on the necessity for an "optimal diet"—an attitude long overdue. The rugged conservatism of Hutchison has been smoothed out by the hands of the revisers.

A more logical arrangement of material has been adopted than in the previous edition. Following an historical outline of the subject, the purpose, limitations, and pitfalls of dietetics are admirably summed up; in particular, objection is voiced to the lax manner in which such terms as "food value", "balanced diet", "malnutrition" *et cetera* have been used in popular expositions of the subject. Throughout the work some success has been achieved by the introduction to the subject of dietetics of the precision of expression which it has in the past so sadly lacked. The limitations of the exactness of the subject nevertheless are clearly set down.

Considerable expansion of the chapters dealing with the theoretical side of nutrition has been deemed necessary. Those concerning calorimetry and metabolism, requirements and supply of proteins, carbohydrates, fats, minerals and vitamins have been considerably extended, with much new data. Little change has been made in the rest of the book, dealing with detailed foods and diets, apart from that necessary to incorporate the results of recent analyses and investigations. An interesting summary of the case of white versus wholemeal bread is included.

Set up, printing and binding are good; the use of finer, smoother paper is advantageous. Altogether this is a successful rejuvenation of a valuable old work.

ORTHOPTICS AND SQUINT.

THE second edition of "Practical Orthoptics in the Treatment of Squint", by Dr. Keith Lyle and Miss Sylvia Jackson, is most welcome.² At present it has a special value as a guide to the recognition and the treatment of muscular imbalance in members of air crews and in those aspiring to become members. The harmonious working of ocular muscles and fully developed stereoscopic vision are the essentials for that all-important ability to judge distances. These factors lessen some of the problems in the early days of learning to fly as well as in the later days, when fatigue is an unavoidable hazard. The uses of the various instruments for the development of fusion and stereopsis are well described. Many practical suggestions are given. Abstracts have been made from the recent works of Chavasse, Livingston and Travers. The description of how to make the fullest use of the rotating stereograms is somewhat inadequate.

While there is much to praise and little to criticize, for the sake of the next edition it may be wise to ask for the supply of certain information. It is remarkable how difficult it is to obtain a description of how to use the stereoscope. The searcher for this must consult *The British Journal of Ophthalmology* of 1927. It would be wise to inform the reader of the advantages of Verhoeff's method of combining occlusion with the Maddox's rod test and of Lancaster's method of mapping heterophoria fields and of estimating, though imperfectly, stereopsis as a percentage by the Keystone method. One error has escaped notice in the description of the findings when an inferior rectus muscle is paralysed: for the words "on the side of the head tilt when the opposite eye is used for fixation" one should read "on the side opposite the head tilt when the other eye is used for fixation".

A very interesting appendix completes the work. It is an analysis of all cases treated and investigated in the orthoptic department of the Royal Westminster Ophthalmic Hospital in the course of the year 1938. It refers to 450 new patients and 116 whose treatment had been commenced in the previous year. This is one of the features of this edition that make this book indispensable to all oculists who treat squint and heterophoria.

¹ "Hutchison's Food and the Principles of Dietetics", revised by V. H. Mottram, M.A., and G. Graham, M.D., F.R.C.P.; Ninth Edition; 1940. London: Edward Arnold and Company. Demy 8vo, pp. 675, with diagrams. Price: 21s. net.

² "Practical Orthoptics in the Treatment of Squint", by K. Lyle, M.A., M.D., M.R.C.P., F.R.C.S., and S. Jackson, with a foreword by C. L. Gimblett, M.A., M.D., M.R.C.P., F.R.C.S.; Second Edition; 1940. London: H. K. Lewis and Company Limited. Demy 8vo, pp. 356, 101 illustrations, including 5 plates. Price: 15s. net.

¹ "A Code of Rules for the Prevention of Communicable Diseases in Schools", issued by The Medical Officers of Schools Association; Tenth Edition; 1940. London: J. and A. Churchill Limited. Demy 8vo, pp. 71. Price: 3s. net.

The Medical Journal of Australia

SATURDAY, MAY 24, 1941.

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References to articles and books should be carefully checked. In a reference the following information should be given without abbreviation: Initials of author, surname of author, full title of article, name of journal, volume, full date (month, day and year), number of the first page of the article. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

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MEDICAL INSPECTION OF SCHOOLS IN VICTORIA.

Few people will deny that the regular medical examination of school children is one of the most important features in the practice of preventive medicine. In such matters it is well to remember the trite saying that the child is the father of the man. A healthy child has a good chance of growing into a healthy adult, but an unhealthy child or one that has a bodily or a mental defect is grossly handicapped and will in all probability remain unhealthy or defective throughout the whole of life, unless remedial measures are adopted at an early age. The practice in adult life of such a branch of preventive medicine as industrial hygiene is generally conceded to be valuable and even necessary; but clearly it will be shorn of much of its effectiveness if the recruits to industry are not in a fit state of mind and body to undertake it. The uninstructed among the laity need to be reminded that the school age is one of rapid development, in which small defects may easily become exaggerated and faulty habits may become ingrained and lead to defects; that childhood is susceptible to illnesses, particularly the exanthemata, which sometimes leave permanent damage in their train; and, finally, that illness may be prevented, bad habits in their early stages may be cured and defects corrected. For many years the children attending the schools controlled by the governments of the several Australian States have been subjected to periodical examination. For this purpose the State departments employ school medical officers who give their whole time to the work. If we point out, as we should, that in some States the work is more effective than in others, lack of enthusiasm in the medical personnel cannot be held responsible; the reason will almost certainly be found in the handicap imposed by smallness of staff, and possibly in lack of cooperation by persons outside the medical branch of the department.

The medical inspection of school children passes unnoted by the general mass of the public and also, more is the pity, by many medical people. There is nothing spectacular about the work, and reports by the workers, like so many other such documents, seem to find a resting place, peaceful and undisturbed, in the official Nirvana created for the purpose. The report of Dr. Eileen FitzGerald, chief medical inspector of the Education Department of Victoria, for the year 1939-1940 must be saved from this fate, for it is full of important information. The report itself is issued to the world with all the odds against even its discovery—it is carried as a kind of after-thought to the "Report of the Minister of Public Instruction". The Minister makes no reference to the important work of Dr. FitzGerald's department, but from her statements we learn that the present staff consist of the following officers: seven medical officers; nine dental surgeons; eleven dental attendants (three temporary); two school nurses (one temporary), a third has lately been added to the staff; and two disinfectors (one temporary). The work done during the year may be summarized as follows. The number of teachers examined was 1,727 and of children 32,808; the number of children treated by the dentists was 28,374, and the school nurses paid 6,946 visits to 5,570 homes. The total cost of this service, exclusive of clerical assistance, was £16,206, and of this amount £12,014 went in salaries. No one who gives a moment's consideration to the extent of the work (dental treatment, it should be explained, is entirely free) can possibly believe that the cost is excessive; unfortunately its results cannot be immediately demonstrated and its saving to the nation in pounds, shillings and pence can never be determined. Since Dr. FitzGerald made her last report there has been no expansion of the school medical service. There is room for expansion, and a vacancy on the staff of medical officers that has been existing since 1929 has not been filled. The original intention of the department was that every child should be examined three times during its school life, but with the present staff "it is possible to keep under review only a fraction of the school population". Up to the present time many of the metropolitan schools have never been included among those examined, and in some country districts it has been found impossible to revisit a school within five years. Of the 32,808 children examined, 19,616 were in country districts and mostly in rural schools. There is a challenge to both the medical profession and the State in the statement that, on account of the distances and the cost involved, it is often difficult for parents to obtain the treatment advised.

Two aspects of the report to which special attention must be directed deal respectively with a survey of children with defective vision and a survey of the frequency of rheumatic infection. The vision survey is in our opinion of the greatest value and importance. It was necessarily limited, but at the same time the information given by it should act as a stimulus to further action. Observations were made during 1937, 1938 and 1939. Some of the main findings show that of 2,968 high school boys, 0.87% had a vision of 6/60 or less in one eye and a vision of 6/6, 6/9, or 6/12 in the other eye; and 1.78% had vision of 6/18 or less in both eyes. Among 3,045 girls the figures for these two groups were 0.394% and 2.4%. Among 4,789 boys from elementary schools, 1.2% had a vision of 6/18 or less in both eyes; among 4,616 girls the

percentage was 1.38. Of 717 boys examined in homes and institutions, 1.11% had vision of 6/36 or less in both eyes; for 546 girls the percentage was 1.47. Dr. FitzGerald and the members of her staff have shown by this preliminary survey that there is urgent need in Victoria for the establishment of one or more sight-saving schools such as that opened recently by the Department of Education of Tasmania. The word "preliminary" is used because, as the Ophthalmological Society of Australia (British Medical Association) has rightly maintained, there is need for a survey to be made throughout the Commonwealth in order that the extent of the whole problem of blindness in Australia may be gauged. If Dr. FitzGerald and her associates continue their surveys of vision, and we trust that they will be able to do so, their example may be followed by others in a larger sphere.

In her attempt to assess the frequency of rheumatic affections in the school population of Victoria, Dr. FitzGerald has had a special scrutiny made of children examined between July 1 and the December vacation in 1938. During this period 15,418 children were examined—7,193 boys and 8,225 girls. Approximately half the children were seen in suburban and city schools and half in country areas. A history of some rheumatic affection was given by 10.6% of the children; 11.7% of these came from city primary and technical schools, 10.3% from city primary schools, and 9.7% from country primary schools. A rheumatic heart condition was present in 0.1% of children. There was no difference in the incidence in primary schools in industrial suburbs and in good residential areas—both areas had an incidence of 10.3%. There was very little variation in the incidence in the different country districts. It was found that 5% of the children had been affected before they entered school; but a rapid access of infection occurred from seven to eleven years of age. Of the rheumatic children, 46.3% gave a history of having had sore throats and 38% a history of affected tonsils. This last-mentioned figure loses some of its significance when we read that of 24,030 children examined during one twelve-month period 31.3% gave a history of having affected tonsils. Gross malnutrition was also investigated, and it is of interest to note that the percentage of rheumatic children grossly undernourished was slightly less than that found in a special investigation into malnutrition in city schools in 1937-1938.

From the foregoing it is clear that Dr. FitzGerald has done more than carry out a routine inspection of children; she has combined her inspection with the investigation of special problems. This at once raises the question, first of all, whether she should be given a larger staff to enable her to extend her activities, and secondly, whether there should not be some coordination of the activities of the school inspection staffs in the several States so that similar problems might be investigated in all centres and information valuable to the whole of the Commonwealth obtained. Probably the requirements of the fighting forces will prevent any increase of staff at the present time; but there is no reason why the heads of the medical services in the education departments of all the States should not meet at regular intervals to plan some common course of action. In the early days of medical school inspection this was done, but as the departments in the

several States have become firmly established they have tended to become more and more isolated from one another. In spite of the war, this isolation should not be allowed to continue. The two States whose medical inspection staffs are large in comparison with the others should collaborate to bring about a closer liaison between all six State departments.

Current Comment.

A BOOK ON FOOD FOR THE AUSTRALIAN PEOPLE.

MEDICAL PRACTITIONERS are supposed to know all about diet and are expected to be able to answer at a moment's notice any question that their patients may put to them about what food they shall eat, how much food is needed to maintain ordinary health, and when it shall be eaten. It has been said that Australian doctors are not particularly well informed on the finer points of diet in disease and that they do not take a great interest in the subject. This may or may not be true; we do not believe that it is. But even if they do find the study of diet more prosy than the study of drugs, Australian medical men and women know that they have in nutrition a subject which, when properly applied, will yield surprising results in preventive medicine. The application of knowledge on nutrition is not always easy; medical practitioners need a book, clearly and simply written, complete and authoritative, which they may put into the hands of their patients. Such a book has recently been compiled by the Nutrition Committee of the National Health and Medical Research Council and edited by Dr. F. W. Clements.¹ The Nutrition Committee, in the persons of Professor Sir C. Stanton Hicks, Professor D. H. K. Lee, Dr. L. Ivan Maxwell, Professor Henry Priestley, Miss Betty Wilmot, Professor W. J. Young and Dr. F. W. Clements (convener), has produced such a valuable document that we propose to draw attention to it in these columns rather than under the section devoted to reviews.

At the outset it should be made clear that many of the statements in this book are based on facts collected since 1936 by the Commonwealth Advisory Council on Nutrition. The Advisory Council furnished in all six reports to the Commonwealth Government, and among the tasks that it undertook was an analysis of a large number of domestic food budgets supplied by thousands of housewives from different parts of Australia. When the Advisory Council on Nutrition was abandoned, the Nutrition Committee of the National Health and Medical Research Council was appointed to carry on its work, and this committee has issued the present work in the hope that it will serve as a contribution towards the improvement of national health and so of national fitness.

The scope of the book is shown by the titles of the following chapters: "Nutrition and National Survival", "Food—Its Composition and Use", "Food Requirements", "The Preservation and Cooking of Food", "The Economics of Meal Planning", "Substitutes for Fresh Foods for Inland Housewives", "Diet in Relation to the Causation of Disease", "Diet in Pregnancy and Lactation", "The Special Food Problems of the Tropics", "Food Fads and Fancies".

The first chapter on nutrition and national survival is stimulating; it should be read by all sections of the public, for in it an attempt is made to disclose "the nature of the subtle causes which operate in modern civilized communities so as to create what has become popularly spoken of as the 'nutrition problem'". It is a commonplace that man's food derives from the soil, and for this very reason the real significance of man's close dependence on the soil is often overlooked. Under present-day conditions many more people live in cities than in the country, commerce and industry absorb man's time, and

¹ "Diet and Nutrition for the Australian People", edited by F. W. Clements, M.D.: 1941. Sydney: Angus and Robertson Limited. Demy 8vo, pp. 99, with diagrams. Price 2s. 6d. net.

mechanization is synonymous with progress. As a result the source of man's food is not farming, but "primary industry". We should think in terms of agriculture, a word that implies a biological and not a mechanical activity. Agriculture should occupy a key position; but we are reminded that if instead it becomes a primary industry, run for commercial profit on the grand scale, our attention and energies are directed mainly towards commercial ends, and history shows what may be expected to follow. When the soil is allowed to deteriorate, the food value of its products also deteriorates. Australians who have seen the present-day Australian aborigines, look on them as pitiable specimens of humanity; the Nutrition Committee, however, points out that the aboriginal is only a product of the worst of our dietary, and that his condition points to a possible factor in some of the aspects of our physical decay. Social custom, commercial practice and mechanized industry contrive to complicate the picture by interposing refinement, preparation, chemical treatment and also advertisement and salesmanship between the original product of the soil and the consumer. So it happens that grain, instead of being roughly milled by stone mills supplying local needs from local crops, is selected for special selling qualities utterly divorced from dietary needs, and subjected to the greatest mechanical and chemical refinement that can be devised by an ingenious mankind. The foregoing are some of the arguments put forward in an attempt to show that nutrition has a nationally important social aspect; the attempt is certainly successful. There are other features of the problem that are of social importance; three are mentioned—national health, the basic wage and population growth. Though these are not purely and solely problems of nutrition, they depend for their solution largely on the question of food. A scathing indictment is made against the way in which the basic wage is fixed. We are reminded that the dietary scale which was used for the wage calculation in 1911, was drawn up before anything was known about vitamins. It is true that the scale was revised in 1920, when knowledge of diets was more advanced, but even to this day the revised scale of 1920 has not been made the basis for decisions on the basic wage.

In the chapter on the composition and use of food these questions are discussed in a way that can be understood without any difficulty by a non-medical person. A useful feature is the listing of different foods under the heading of the several vitamins, the comparative richness being shown by a series of *plus* signs. In the chapter on food requirements, quantities are expressed in terms of Calories; but at the same time reference is made to pounds, pints, and so on, in places where it will make the story simpler. In a summary we read the quotation: "Make sure that the diet is adequate in 'protective foods' first and then add others afterwards." Then appears a table in which we read that ideally each person should take every day one pint of milk, one egg, one ounce of butter, one large serving of potato, one serving of green leafy vegetables, one serving of other vegetables, one orange or half a large grapefruit or the juice of one orange. The use of wholemeal bread is recommended and cakes and biscuits are to be reduced to a minimum. "Add to the above collection of foods one or two servings of meat a day, with liver as an alternative once a week, and the diet is balanced." At first sight the quantities of the special food just stated may seem to conflict with the amounts set out in the chapter on the economics of meal planning; in the latter smaller quantities are given. It appears, however, that the amounts in the chapter on economics are the minimum quantities that should be taken and requirements are met by the careful inclusion of many items; for the general reader this ought to be more clearly explained. Nowhere in the food budgets is any mention made of alcohol. Presumably the man's "schooner" of beer that he takes on his way home from work is an extra; he ought, however, to be told that his beer has a caloric value. A section on alcohol in such a book as this would not be amiss, particularly in view of the enormous amount of money spent every year in Australia on alcoholic drinks. During 1937-1938 the average con-

sumption of beer per head of population was eleven and a half gallons.

The chapter on diet in relation to disease includes discussions on deficiency diseases, anaemia, dental caries and obesity. A useful specimen of a well-balanced diet of 1,000 Calories is given. The chapter on diet in pregnancy and lactation also concludes with a list of articles of food for inclusion in the diet during pregnancy and lactation. Practical advice on food for the tropics is given in five useful rules, and we are told here that in the tropics increased consumption of alcohol is neither necessary nor desirable in hot weather. In the chapter on food fads and fancies we find a patch of humour of a kind that is all too rare in this book: "A very common food fancy is vegetarianism. This may be based on the belief that meat eating makes a man savage like a tiger, while pure vegetarianism makes one placid like a cow. Who wants to be like a cow?" Who, indeed?

Stress has already been laid on the value of this book. Medical practitioners would be well advised to have a copy at hand in their consulting rooms; they would find it most useful for many types of patients. The "B.M.A. Spokesman" would be doing a service to the community if he devoted one of his talks solely to this book.

STAPHYLOCOCCAL INFECTIONS AND SULPHATHIAZOLE.

INVASION of the blood stream by staphylococci is usually attended by grave consequences. Mendell found that the mortality in a series of 314 cases was 77%. It is now believed that the high mortality rate is due in part to powerful exotoxins produced by certain strains of staphylococci and it has been stated that the prompt administration of antitoxin is effective in combating this toxæmia. But the antitoxin does not affect the bacteria themselves and the staphylococcus has more weapons than one. Some strains which produce little or no exotoxin are highly invasive and therefore pathogenic. The aim of treatment must be to attack the bacterium itself and not merely to neutralize its toxins. Wesley W. Spink, Arild E. Hansen and John R. Paine describe the treatment with sulphapyridine and sulphathiazole of patients with staphylococcal bacteraemia.¹ During the past three years they have observed 100 patients with various types of staphylococcal sepsis. Staphylococci were isolated from the blood streams of 50 of these patients and 25 of them are included in the series presented. Ten patients were treated with sulphapyridine. Four of the patients in this group died. Fifteen consecutive patients were treated with sulphathiazole. Essentially the same oral doses were employed as for sulphapyridine. Attempts at blood culture failed in all fifteen cases in which sulphathiazole had been used, and all the patients recovered from their acute infections, though one subsequently died of myelogenous leucæmia.

The authors emphasize the fact that although sulphathiazole will sterilize the blood stream, viable organisms will persist in localized abscesses and metastatic lesions. It is therefore imperative that abscessed areas be adequately drained. Further, any patient in whom foci of infection persist must be kept under observation for a long period, because invasion of the blood stream may recur. In a note added at the time of publication, the authors add four patients to their series. These were four children with staphylococcal bacteraemia, of whom three recovered, while the fourth died. The whole series of nineteen patients treated with sulphathiazole is certainly of great interest. Brief clinical histories are given and it seems likely that in some of these cases the bacteraemia was transient, and disclosed only by routine attempts at blood culture. Others appear to have been cases of severe pyæmia in which recovery is truly remarkable. The authors comment that the levels of free sulphathiazole in the blood were less than six milligrammes per hundred cubic centimetres. They find it difficult to state what concentration will give the maximum therapeutic effect.

¹ *Archives of Internal Medicine*, January, 1941.

Abstracts from Medical Literature.

MEDICINE.

Anæmia and Water Retention.

ŒDEMA is of common occurrence in patients suffering from anæmia. The determination of its presence or absence and its magnitude is a matter of clinical judgement and there is no method of quantitative estimation of any accuracy. Maurice B. Strauss and Herbert J. Fox (*The American Journal of the Medical Sciences*, October, 1940) have found that it is possible to determine the tendency to œdema by observing the changes in body weight which occur within a relatively short period of time following the administration or withdrawal of sodium salts. In a previous communication the authors demonstrated that in pregnant women in the absence of anæmia the percentage increase in body weight following the administration of sodium salts could be correlated in linear fashion with the colloid osmotic pressure of the plasma proteins. Now, by similar methods, it has been found that in a series of twenty-six patients suffering from anæmia of varying type, the magnitude of water retention varied inversely with the hæmoglobin level. All patients were ambulatory; they were allowed fluids as desired and the usual ward diet. The following observations were then made daily: body weight, hæmoglobin estimation, venous pressure and plasma protein values. After three or four days' supervision, 23 grammes of sodium bicarbonate or 16 grammes sodium chloride were administered daily for ten days. The venous pressure was found to be within the normal limits, the highest reading being 10.5 centimetres of water. The hæmoglobin levels varied from 30% to 94% of 15.6 grammes per 100 cubic centimetres. The calculated colloid osmotic pressure of the plasma protein varied from 63% to 98% of 300 millimetres of water. The maximum amount of water retained within a period of ten days following sodium administration and measured by weight gains varied from 0.8% to 10.8% of original body weight. By correlation of the various results obtained, it was possible to conclude that there was no alteration of venous pressure or colloid osmotic pressure of plasma protein to account for the water retention observed. There is no evidence that anæmia leads to altered capillary permeability or that arteriolar dilatation may occur leading to higher filtration pressure in the capillaries. It is noted therefore that anæmia, *per se*, leads to a tendency to water retention.

Potassium Cyanide and Experimental Demyelination.

THE aetiology of the demyelinating maladies is still in doubt. Potassium cyanide administration to laboratory animals leads to changes in the grey and white matter of the nervous system. E. W. Hurst (*The Australian Journal of Experimental Biology and Medical Science*, September, 1940) carried out experiments on monkeys using potassium cyanide given by the parenteral route to determine the exact mechanism of demyelination in the hope that this would furnish clues to the aetiology of the human diseases. It was found that

areas of partial or complete demyelination and of actual necrosis may occur in the white matter in the brains of monkeys poisoned with potassium cyanide, and that this occurs independently of lesions in the grey matter. Under the conditions of these experiments, in which large doses were administered daily, lesions in the white matter were the most obvious and necrosis was perhaps more frequent than demyelination. Necrosis may occur suddenly and simultaneously over wide stretches of cerebral white matter. In distribution the lesions bear considerable resemblance to those of Schilder's diffuse sclerosis and in histological detail to those of acute epizootic leucoencephalitis of horses. All the signs of acute inflammation may accompany these lesions due to a simple chemical agent.

The Blood in Hæmatemesis.

A SYSTEMATIC study of factors influencing bleeding in general has been undertaken by H. R. Moss *et alii* (*American Journal of Digestive Diseases and Nutrition*, November, 1940). They observed a series of 44 patients who were under hospital treatment for hæmatemesis and melena. Plasma vitamin C levels were determined upon admission and compared with levels of normal individuals and a group of ambulatory ulcer patients who were not suffering from hæmorrhage; the previous findings that peptic ulcer patients on restricted diets have a lower average plasma vitamin C level than patients at large were confirmed. In contrast, however, the hæmatemesis patients had higher average levels than those of patients with ulcer alone, and over 20% of patients with bleeding had blood levels within the normal range (0.6 to 1.47 milligrammes per centum, average 0.99 milligramme). Vitamin C saturation tests did not reveal any appreciable deficiency. The state of capillary resistance was established by both positive and negative pressure methods; no adequate correlation between plasma cevitamic acid levels and the appearance of petechiæ could be obtained. The "Duke bleeding time" was normal, but the "Ivy bleeding time" was prolonged in thirteen cases in the group under review; no correlation existed between this finding and others associated with bleeding; further, the "Ivy bleeding time" returned to normal when studied at a later date. The serum phosphorus content was normal, but the serum calcium content was slightly below normal in six cases. The clotting time was shorter than normal, as would be expected following hæmorrhage, only to return later to the normal range. Significant prolongation of prothrombin time or reduction of prothrombin content of the blood was not found. Blood fibrinogen, blood platelets and bone marrow biopsies gave no evidence of change. The only abnormal findings of prolongation of "Ivy bleeding time" and serum calcium levels cannot be satisfactorily explained.

Pepsin in Pernicious Anæmia.

ACCORDING to some authorities, pepsin is antagonistic to Castle's intrinsic factor in the stomach; pepsin is predominantly a product of the fundus portion of the stomach. Samuel Morrison (*Annals of Internal Medicine*, August, 1940) assumed that failure to demonstrate the antipernicious anæmic effectiveness in fundus tissues could be

attributed to their pepsin content. To test this hypothesis three patients with previously untreated pernicious anæmia were given depepsinized whole stomach mucosa and depepsinized fundus and pylorus mucosa, obtained from the hog's stomach under proper conditions for the preserving of antipernicious anæmia potency according to Greenspon. Careful observations were made during therapy and it was noted that feeding with the above substance without extrinsic factor was not effective in securing reticulocytosis. The addition of extrinsic factor, however, gave minimal though definite evidence of antipernicious anæmia activity. In considering these results the author made an attempt to evaluate the relative roles of intrinsic factor, extrinsic factor and intestinal permeability. The absorption ability of the intestinal mucosa is a rather uncertain factor in cases of pernicious anæmia, since it is not altogether unlikely that the morbid process underlying the disease also produces impairment of cell permeability. Perhaps this is one reason for the greater efficacy of intramuscular therapy. It is suggested that the possibility of completely depepsinizing fundus tissues by present methods is debatable, and this may be the factor in the complete inactivity of fundus preparations. It was not possible to draw definite conclusions regarding the role of pepsin in pernicious anæmia; the suggestion that the fundus of the stomach performs some role in pernicious anæmia is now being investigated.

Spontaneous Hypoglycæmia.

J. W. CONN (*The Journal of the American Medical Association*, November 16, 1940) discusses spontaneous hypoglycæmia. In only 13 of 278 cases recorded by Martin and Hellmuth were symptoms of hypoglycæmia present when the fasting blood sugar fell below 60 milligrammes per 100 cubic centimetres of blood. The underlying basis for hypoglycæmia may be one of several conditions. Tumour and hyperplasia of the pancreas, fatty degeneration, carcinoma, glycogenosis, toxic hepatitis and other liver disorders, pituitary disorders, adrenal neoplasm, and brain stem lesions are included in the organic causes. The functional disorders are hyperinsulinism, renal glycosuria, severe continuous muscular work, and pregnancy and lactation. The organic causes usually produce a progressive deterioration in health with symptoms of hypoglycæmia at times. In the functional conditions there is no progressive deterioration. The condition remains to some extent during life. Full investigation of the patient's whole condition is necessary for diagnosis. Adrenalin in oil is effective in some cases of hypoglycæmic crisis. In functional hypoglycæmia a diet high in carbohydrate induces more frequent attacks by causing an added stimulus to production of insulin. Glucose administration for this reason is not good treatment. Frequent feedings and a diet high in protein are most effective; about two grammes of protein per kilogram of body weight should be given.

Pneumococcal Cross-Infection.

H. A. HOLLE AND J. G. M. BULLOWA (*The New England Journal of Medicine*, November 28, 1940) discuss pneumococcal cross-infections in the home and hospital. Pneumococcal

pneumonia is an acute communicable disease. Five cases of cross-infection in home and hospital were recorded. In one family two cases of Type II pneumococcus pneumonia occurred within five days; in another family six cases of Type I pneumonia occurred all within ten days. This family lived in a small five-roomed apartment. In two other families Type V and Type I infections occurred in two members within a few days. This series of infections can scarcely be explained by coincidence, and in fact it is almost certain that none of these cross-infections was a coincidence, but each member of the family contracted the infection from a near relative in the same house. The author emphasizes the importance of early isolation and endeavours to prevent spread of infection. Four cases of cross-infection in hospital were also reported. The first two were infections with Type VII. These patients were visited by other patients who had suffered from Type V pneumonia, with the result that the former were reinfected with another type of organism. In another case the nurse appeared to have been responsible for the transference of infection from one patient to another. The authors advocate an aseptic technique in pneumonia which would include isolation of pneumonia patients from the onset of the disease and during convalescence for an indefinite period.

Abdominal Actinomycosis.

G. C. DORLING AND N. L. ECKLOFF (*The Lancet*, December 7, 1940) describe the treatment with sulphanilamide or sulphapyridine of five patients suffering from abdominal actinomycosis. Several cases have been reported in which recovery took place on sulphanilamide treatment. In the cases recorded here the patients were all males between eight and thirty-two years of age, who were admitted to hospital with a complaint of abdominal pain of short duration—two or three days. In all the pain was on the right side of the abdomen, and appendicitis was diagnosed in every instance. All the diagnoses were proved pathologically by the finding of *Actinomycosis bovis* along with other organisms in the pus discharged after operation for appendicitis. In three cases indurated masses could be felt in the lower part of the abdomen or *per rectum*. The dosage with sulphanilamide and sulphapyridine varied from two tablets three times a day to two tablets every four hours. In two cases an initial dose of four tablets was given (two grammes), then two tablets every four hours for four days and one tablet every four hours for seven days. Four out of five patients recovered, though all were seriously ill for many weeks. It is suggested that in all suspected cases of abdominal actinomycosis sulphanilamide or sulphapyridine should be employed.

Polyradiculoneuritis.

H. S. BARBER (*The Lancet*, November 2, 1940) describes a series of cases of polyneuritis in East Anglia which conformed to the type known as Guillain-Barré's syndrome. The condition in these cases closely resembled Gordon Holmes's febrile polyneuritis, except for the absence of fever and the presence of acellular albuminosis. The onset is sudden in adults of either sex between twenty and thirty years of age. Sore throat, paresthesia of feet and hands, and weakness of limbs are

early symptoms. Symmetrical palsy of the distal parts of the limbs is usual. Hypotonia and absence of tendon reflexes are noted. There is no true muscular atrophy of the limbs, and the electrical tests do not show the reaction of degeneration. Numbness, tingling, pain and tender muscles persist for some time. There are slight diminution of pain, touch and temperature sensibility, and changes in deep muscle sensation and stereognosis in some instances. Fever is rare. The spinal fluid shows increased protein in the majority of cases, but the fluid is clear and there is no other abnormality. Complete recovery after weeks or months is the rule. The majority of cases occur in autumn and winter. The condition is thought to be due to a neurotropic virus. Histologically, interstitial neuritis, lymphocytic infiltration and alterations in myelin sheaths and axis cylinder have been recorded. Treatment is mainly symptomatic.

Liver Function Test.

E. J. KING AND R. S. AITKEN (*The Lancet*, November 2, 1940) describe an intravenous galactose tolerance test. Fifty grammes of galactose are prepared and sterilized by filtration and steaming in 100 cubic centimetres of solution; 0.5 gramme of galactose per kilogram of body weight is slowly injected intravenously over five minutes. The blood is tested five minutes, half, one, one and a half and two hours after the injection. In the normal subject the galactose curve in the blood begins at about 200 milligrammes per 100 cubic centimetres, falls steeply during the first hour, and reaches the 0 to 10 milligrammes per 100 cubic centimetres level at the end of the second hour. In obstructive jaundice much the same curve is usually obtained. In conditions of liver damage the galactose does not return to normal in two hours, but tends to remain in the region of 50 to 60 milligrammes per centum. These latter results have been obtained in hepatitis and cirrhosis of the liver.

Cod Liver Oil in the Treatment of Tuberculosis.

A. L. BANYAI (*The British Journal of Tuberculosis*, July-October, 1940) describes the results of the topical application of cod liver oil to 270 persons suffering from tuberculosis. Pharyngeal and laryngeal ulcers showed rapid epithelialization and healing when the oil was applied to them by means of a spray, and dryness, tickling and burning sensation in the throat disappeared "rather promptly". Laryngeal tuberculosis with infiltration and with vegetative granulation responded well to the treatment, but when much oedema was present the treatment was not effective. Tuberculous empyema (uncomplicated by bronchopleural fistula) was found to respond favourably to aspiration of the pus and its replacement with cod liver oil in amounts of 45 to 300 cubic centimetres. Cold abscesses arising from tuberculosis of lymph glands healed well when the pus was repeatedly aspirated and one-fourth as much cod liver oil injected. For phlyctenular conjunctivitis, eye drops of cod liver oil caused the lesions to heal more rapidly than did other forms of treatment; but satisfactory results were not obtained in the treatment of tuberculous keratitis. Fistulae resulting from tuberculous epididymitis healed

well when cod liver oil was injected into the fistulous tract. Nineteen tuberculous ischio-rectal fistulae were treated by daily injections of cod liver oil into the fistulous tract while the patient lay prone, in which posture he stayed for twenty minutes. Satisfactory results were observed in the great majority of cases in which the injections were continued for two months or longer. The results of the topical application of cod liver oil were invariably good in scrofuloderma, and four out of five cases of *lupus vulgaris* responded favourably. The author deduces from various researches recorded in the literature that the therapeutic property resides in some constituent of the oil and is not altogether the result of any mechanical action of a film between the bacterium and its source of nutriment; and also that this constituent is vitamin A.

Fear and the Electrocardiogram.

F. MAINZER AND M. KRAUSE (*The British Heart Journal*, October, 1940) found at the Jewish Hospital, Alexandria, that when electrocardiographic tracings were made from 53 persons lying on the operating table immediately before the induction of general anaesthesia abnormalities had developed in 24 since the previous day. Half of the 24 patients were under thirty years of age. The abnormalities which appeared consisted of depression of ST below the iso-electric level and flattening or inversion of T, ST and T showing some deformation similar to that appearing in coronary insufficiency, or of elevation and pointing of P and T as in neuro-circulatory asthenia, or of a combination of these changes. Sometimes the tracings were found to resume their original form after the induction of anaesthesia, and the authors attributed the changes which had been present to fear.

Some Hormonal Factors of Oedema.

G. W. THORN AND K. EMERSON (*Annals of Internal Medicine*, November, 1940) produce evidence to show that the electrolyte balance of the body may be affected significantly by the steroid hormones of the gonads and of the suprarenal cortex. Under certain conditions, they believe, these hormones may act as precipitating factors in the production of oedema. Careful restriction of sodium chloride intake combined with supplementary administration of potassium (10 cubic centimetres of a 20% solution of potassium citrate given in fruit juice three times a day) was found to prevent or improve such oedema, especially premenstrual oedema.

Gout.

P. S. HENCH (*The Journal of the American Medical Association*, February 8, 1941) discusses diagnosis and treatment of gout and gouty arthritis. Gout is common in America and is often unrecognized. It usually attacks men of between thirty-five and forty years of age, coming on suddenly in one or more joints of the lower limbs and lasting three to ten days or more. The great toe, instep, ankle or knee is most often affected. The attack is often monarticular and afebrile. Attacks recur often in a year, and later twice a year, in spring and autumn. Eventually stiffness and deformity of joints are noted, and at this stage many joints may be affected. There may be or may not be hyperuricæmia and

tophi in the early stages; later both are frequently observed. The great toe joint is usually attacked sooner or later. Minor traumata or dietary indiscretion, surgical operations and psychic upsets often precede attacks of gout. Liver extract, mersalyl, ergotamine tartrate, ketogenic diet, thiamine hydrochloride (vitamin B_1), decholin and insulin sometimes provoke gout. Remarkable freedom from symptoms is often noted during remissions. Treatment involves a diet free from purines and low in fats; milk, eggs and cheese are allowed in reasonable amounts. Alcohol is contraindicated. The acute attack is best treated by a brisk cathartic, such as magnesium sulphate, half to one ounce; magnesium citrate or sodium phosphate; rest in bed; the application of heat or cold compresses; colchicine tablets, $\frac{1}{100}$ or $\frac{1}{100}$ of a grain, two tablets at the onset and one tablet every two or three hours until pain is relieved or nausea, vomiting or diarrhoea occurs. Colchicine is more effective than the wine or tincture. Codeine, half to one grain, or morphine, one-sixth to one-quarter of a grain, may be necessary to relieve pain at first. Cinchophen in a dose of seven and a half grains thrice daily for three days a week for three weeks, each dose followed by 30 grains of sodium bicarbonate or potassium citrate in water, and two litres of water a day are necessary after the pain has been relieved by colchicine. At the Mayo Clinic cinchophen is continued indefinitely in this way. However, if the blood uric acid content becomes normal or nearly normal, the cinchophen can be omitted or given in diminished doses.

Insulin.

H. ULRICH (*Annals of Internal Medicine*, January, 1941) describes clinical experiments with mixtures of standard and protamine zinc insulin thoroughly mixed before use. Various methods of using standard and protamine zinc insulin have been tried. If separate injections are given, one of the main advantages of protamine insulin is lost, namely, reduction in the number of doses. Mixtures of the two forms of insulin have the disadvantage that protamine zinc insulin contains excess of protamine, hence added standard insulin will combine with excess of protamine to form more protamine zinc insulin, and the activity of mixtures cannot be predicted, because of the uncertainty of the changes taking place in them, so it was said. Peck's protamine zinc insulin is said to contain 1.25 milligrammes of protamine per 100 units of insulin, and the excess of protamine is usually about 40%. Mixture of equal parts of standard insulin (40 units) and protamine zinc insulin (40 units) should contain 28 units of protamine zinc insulin and 12 units of uncombined insulin, provided that the excess of protamine combines with a proportional amount of the added free insulin, a rather doubtful assumption. However, clinical experiments were conducted on this assumption, to ascertain whether such a mixture would give reasonably consistent results. Blood sugar was estimated before and half, one, three and five hours after the combined insulin had been injected into diabetic patients. The results were compared with those obtained after injection of protamine zinc insulin alone and of 28 units of protamine zinc insulin and 12 units of uncombined

insulin given in separate sites. The patients fasted after the evening meal of the previous day until the tests were completed. It was shown that the immediate action of a mixture of equal parts of the two forms of insulin was less than that of separate injections, but greater than that of protamine zinc insulin alone. The blood sugar was steadily reduced from 230 milligrammes to 140 milligrammes in five hours when the mixture was used to 180 milligrammes in five hours with protamine zinc alone, and to 100 milligrammes in five hours with separate injections of the two forms of insulin. A mixture of three parts of standard insulin and two of protamine zinc insulin gave results similar to those obtained with separate injections. A further study showed that when meals were given thrice daily, after an injection of 40 units of the combined insulin, protamine zinc alone and separate injections of the two forms of insulin, with protamine zinc alone a marked hyperglycaemia occurred after each meal, with the two separate forms of insulin the rise after breakfast was avoided, but a high blood sugar level occurred towards evening; results with mixtures were less promising than with separate injections, but the rise in blood sugar after breakfast was less marked than with protamine zinc insulin alone. A mixture of three parts of standard insulin and two of protamine zinc insulin again gave the best results, with a slightly smaller elevation of blood sugar after meals and a more uniform level of glycaemia during the day. It was found that for numerous tests in the same subject fairly constant results were obtained, and the conclusion was reached that the mixtures of insulin were effective and the results predictable with moderate accuracy.

Tetanus Toxoid and "T.A.B." Immunization.

I. H. MACLEAN AND L. B. HOLT (*The Lancet*, November 9, 1940) describe a combined immunization with tetanus toxoid and typhoid, paratyphoid A and B ("T.A.B.") vaccine. "T.A.B." vaccine, ten times normal strength, was incorporated into tetanus toxoid in two different proportions, so that one cubic centimetre of the mixture contained either the usual first dose or the usual second dose of "T.A.B." vaccine. For example, the first portion contained *Bacillus typhosus* 500 million, *Bacillus paratyphosus* A 250 million, *Bacillus paratyphosus* B 250 million, and tetanus toxoid 0.9 cubic centimetre; the second portion contained twice the number of bacilli of each group and 0.9 cubic centimetre of tetanus toxoid. One cubic centimetre of each of these mixtures was injected at intervals of four and six weeks. The serum of the subjects injected was tested for the presence of tetanus antitoxin and for agglutinins to the typhoid and paratyphoid bacilli fourteen days after immunization. A higher titre of antitoxin was found in those injected with the combined toxoid-"T.A.B." mixture than in those injected with "T.A.B." and toxoid separately, as is usually done. The agglutination test showed that just as satisfactory results were obtained by giving the above two doses of "T.A.B." vaccine mixed with toxoid at an interval of one month as is usually obtained by giving the vaccine in separate doses one week apart. Reactions to the combined "T.A.B."-

toxoid injections were no greater than with "T.A.B." and toxoid separately. The authors recommend the above procedure, except in the presence of an enteric outbreak.

Spleen Size in Pernicious Anæmia.

Most authorities state that the spleen is palpable in 30% to 50% of cases of pernicious anaemia. E. Bigg (*Annals of Internal Medicine*, August, 1940) has investigated this in a series of 200 consecutive cases of pernicious anaemia. The duration of the symptoms in this group ranged from two months to ten years, and 124 patients had not had any previous treatment. The spleen was palpable in 3% of cases only. Eighteen cases came to autopsy, in only one of which the spleen was palpable; the spleen weight varied from 95 to 640 grammes (normal 150 grammes). It is obvious that a spleen may be greatly increased in weight without being palpable. It is suggested that the presence of a palpable spleen is of such rarity that if it occurs in a patient suspected of having pernicious anaemia, the possibility of either a complication or of another disease must be considered.

The Pathogenesis of Banti's Disease.

W. P. THOMPSON (*Annals of Internal Medicine*, August, 1940) reports the findings from a study of 100 cases of Banti's disease over a period of ten years. The criteria laid down for the diagnosis are as follows: splenomegaly with anaemia, leucopenia and thrombocytopenia with evidence of the development of increased collateral circulation between the portal and peripheral venous circulation and histological changes in the spleen that are characteristic. It is possible to conclude that direct or indirect evidence of portal vein hypertension exists in all cases; this rise of pressure in the portal vein, in the presence of normal peripheral venous pressure, results in the splenomegaly, collateral circulation and oesophageal varices. A simple mechanical reason for this hypertension can be found in all cases adequately studied. Hepatic cirrhosis exists as the obstructive factor in 68% of cases under review; when cirrhosis is not present at the time of splenectomy, it will not appear subsequently. No clinical or hematological differences can be found between patients with congestive splenomegaly due to intrahepatic or extrahepatic obstructions, except in cases of advanced liver disease, when the clinical features of hepatic insufficiency will appear and assume preponderance. Any lesion producing splenic vein hypertension is therefore capable of producing the symptoms of the disease, and it is suggested that congestive splenomegaly is a more suitable designation than Banti's disease and splenic anaemia.

Cancer of the Stomach.

HOWARD K. GRAY (*The Journal of the American Medical Association*, January 4, 1941) discusses the diagnosis of carcinoma of the stomach and makes particular reference to the significance of persistent symptoms ascribed to the stomach and the malignant potentialities of gastric ulcer. He emphasizes the importance of considering the possibility of carcinoma of the stomach, particularly when symptoms referable to the stomach do not subside and dis-

appear after the administration of simple remedies. There is no characteristic syndrome of malignant disease of the stomach, and it is false to assume that a gastric ulcer cannot be malignant if improvement does occur with simple treatment verified by observation at intervals by a competent radiologist. The author recognizes the malignant potentiality of any ulcerating lesion of the stomach, and illustrates his remarks by the report of a case with the photographs of the radiographic appearances of the stomach.

Experimental Gastric Ulcer.

K. C. CHEN (*American Journal of Digestive Diseases and Nutrition*, January, 1941) considers that the production of experimental gastric ulcers in rats holds out some promise as to the discovery of their aetiology in man. A series of rats was starved for periods up to thirteen days, and in all rats fasted for more than six days shallow gastric ulcers were found. In another series, after starving for varying periods, the animals were fed with a high lactalbumin diet, a casein diet and the stock laboratory diet. All rats starved over seven days developed large craters after these diets had been given. If, however, the starved animals were given 30% lactalbumin in agar-agar the ulcers were shallow and similar to those due to starvation alone. When the lactalbumin was sterilized the ulcers were smaller than when unsterilized lactalbumin was given. From these results the author concludes that unbuffered acid may be a cause of ulcer and that the physical character of the diet and infection have an influence on the lesion.

A Banana Diet in Bacillary Dysentery.

LOUIS H. BLOCK AND ALEXANDER TARNOWSKI (*American Journal of Digestive Diseases and Nutrition*, January, 1941) attribute the efficiency of bananas in disease to their readily assimilable sugars, minerals, protein and vitamins in addition to their caloric value. One hundred and twenty-seven cases of bacillary dysentery were studied; 65 patients were placed on banana diets of various caloric values and 62 served as controls. The weight of those on banana diets increased more than that of controls, formed stools occurred sooner, blood disappeared more quickly from stools, and procto-sigmoidoscopic findings became less abnormal in a greater percentage of cases. However, the mortality rate did not appear to be influenced, although moribund patients responded to the banana diet more satisfactorily than to the usual diet.

Gastric Motility.

ADOLPH SCHINDLER AND MORRIS E. DAILEY (*American Journal of Digestive Diseases and Nutrition*, January, 1941) have made gastroscopic observations on gastric motility. They recall the former observations by Cole that there are two types of gastric waves—peristaltic waves involving the *muscularis propria*, and also "ripples" involving the mucous membrane only. Alvarez has pointed out that it is reasonable to presume the existence of nerve-free muscle fibres which contract rhythmically. He also believes in "pace-making" initiators near the *incisura angularis*, analogous to the sinus node of the heart. The authors have noted

two normal types of pyloric movement, one in which the pylorus closes without circular folds but with longitudinal furrows, and the other in which the pylorus closes by a migratory circular fold. Many gastro-enterostomy stomata were seen with a sphincter action. After comparing the gastroscopic study of a diverticulum stoma with the post-mortem appearances, the authors have come to the conclusion that the musculature of the distal parts of the stomach possesses an intrinsic capacity to produce rhythmic sphincter contractions.

Pulsating Manubrial Tumour.

THOMAS LEWIS (*British Heart Journal*, October, 1940) describes two cases in which pulsating tumours over the upper part of the sternum in syphilitic subjects seemed to indicate pointing aneurysm. Both tumours were in fact secondary deposits from hypernephroma, though in one case aneurysmal dilatation of the aorta was present as well. The author points out that there is a softness and a slowness and a just distinct delay in the rise of the pulse in these pulsating tumours.

Beriberi Heart in England.

In the *British Heart Journal*, October, 1940, are described four cases of beriberi, complicated by serious cardiac affection due to the disease. Three of the patients dwelt in London and one in Newcastle-on-Tyne; two of them were abstainers from alcohol, but their diets were very deficient in vitamin B₁.

The Circulation in Rheumatoid Arthritis.

A. BENATT AND H. J. TAYLOR (*British Heart Journal*, October, 1940) have carried out investigations to discover any functional vascular disturbance which might be present in various types and stages of rheumatoid arthritis. Despite the fact that many rheumatic subjects are especially sensitive to cold, no abnormality of vascular constrictor tone was found, except in one patient with severe deformities, and here it was thought that the abnormality was due to the deformity and not to the rheumatism.

"Physiological Adjustment" to Diabetic Diets.

R. R. SNOWDEN (*Annals of Internal Medicine*, November, 1940) points out that persons suffering from diabetes require a certain time to become completely adjusted to any change in their diet. This time varies from three or four days to several weeks. Therefore, with every change in the régime the new "formula" should remain fixed for at least three or four days or longer if evidence of improvement continues. A policy of consistent unhurried control offers the best chance of success.

Renal Ischaemia and Hypertension.

REED M. NESBIT AND RIGDON K. RATCLIFF (*The Journal of the American Medical Association*, January 18, 1941) discuss Goldblatt's experiments with renal ischaemia. Goldblatt found that partial occlusion of the renal artery of the dog on one side only caused simple hypertension. With the removal of the obstruction the blood pressure became normal immediately. However, if both renal arteries were partially occluded, malignant hypertension appeared and the removal of the

obstruction did not relieve the symptoms. Wilson and Byrom, working with rats, produced malignant hypertension with unilateral renal ischaemia, but recovery occurred after removal of the ischaemic kidney. According to the clinical evidence of the authors, there are three types of kidney lesions associated with hypertension in man: (i) Occlusion of the renal arteries (by a plug of aberrant muscle and infarction in the two cases cited). In these cases cures were produced by the removal of the affected kidney. (ii) Hydronephrosis. (iii) Chronic pyelonephritis. If these diseases were proved to be unilateral by urograms the diseased kidney was removed and symptoms were in the majority of cases relieved. A regression of secondary vascular changes was not noted. Several cases are described to illustrate the theories discussed.

Blastomycosis.

LESLIE M. SMITH (*The Journal of the American Medical Association*, January 18, 1941) reserves the name "blastomycosis" for the lesions caused by the fungus *Blastomyces dermatidis*, and refers to similar mycotic granulomata as "blastomycosis-like infections". He lays stress on the importance of their differentiation because the prognosis and treatment differ so radically. He enumerates eleven mycotic organisms of this series and indicates the characteristic clinical features of lesions caused by each. The organisms are sometimes indistinguishable in section, but are distinguished by culture. Complement fixation, precipitation and agglutination tests are not sufficiently specific to be of diagnostic value. Sporotrichin, coccidioidin and blastomycin, used in a similar manner to tuberculin, are, in the writer's experience, of value in confirming or denying the presence of the corresponding diseases. The prognosis of these diseases varies considerably, as also the treatment.

Protamine Zinc Insulin in Diabetes.

HENRY T. RICKETTS (*The American Journal of the Medical Sciences*, January, 1941) reports the results of a study of eight diabetic patients, undertaken with the object of ascertaining the constancy of action of protamine zinc insulin. The patients were sufferers from diabetes of different degrees of severity. The experimental observations of them were not recorded until it seemed probable that the metabolic status had attained equilibrium; each patient was given a suitable maintenance diet balanced with the requisite dosage of protamine zinc insulin, the time of insulin administration being 7.30 a.m. in some cases and 8 p.m. in others; and blood sugar estimations were made four times daily (7.30 a.m., 11.30 a.m., 4.30 p.m. and 9 p.m.) during the period of observation. In seven of the eight cases the author found that the behaviour of the blood sugar through the day-time and evening hours was essentially the same whether the protamine zinc insulin was given in the morning or at night. He concludes that the action of protamine zinc insulin when injected once every twenty-four hours is relatively constant. Studies in the eighth case of the series were vitiated by an intercurrent infection. The author discusses the practical and theoretical implications of his conclusions.

British Medical Association News.

SCIENTIFIC.

A MEETING of the New South Wales Branch of the British Medical Association was held on April 17, 1941, at the Royal Alexandra Hospital for Children, Sydney. The meeting took the form of a number of clinical demonstrations by members of the honorary medical staff of the hospital. Part of this report appeared in the issue of May 17, 1941.

Polyarthritis.

DR. R. J. TAYLOR showed a female patient, aged two years, who had been admitted to hospital on October 24, 1940. The child had first become ill eighteen weeks previously; the illness had commenced with an infection of the mouth, followed by pneumonia and later by German measles. After the German measles swellings of the hands developed, and later swellings of the knees and feet. Movements were very painful. The child was feverish at night and sweated profusely.

On examination the patient looked pale and ill; swellings of the knees, wrists and fingers were present, with considerable periarticular thickening and moderate tenderness. No abnormality was detected in the heart. Scattered râles were heard in the chest. The temperature was of the "swinging" variety and rose high. Sodium salicylate relieved the pain, but otherwise the child's condition did not improve and the wrists became more swollen. She was given two blood transfusions and a gradual improvement occurred. Extension was applied to the knees with strapping and weights; the wrists were kept in a slight "cock-up" position with aluminium splints. Inoculation of the patient's blood into nutrient media produced no growth of organisms. A blood count made on November 6, before the first blood transfusion, gave the following information: the erythrocytes numbered 3,830,000 and the leucocytes 11,900 per cubic millimetre; the haemoglobin value was 7.5 grammes per 100 cubic centimetres. An X-ray examination of the knees revealed a small effusion in both knee joints. The blood sedimentation rate, estimated on October 25, was 32 millimetres in the first hour and 49 millimetres after two hours. No abnormality was detected in the urine.

Dr. Taylor showed another female patient, aged three years, who had been admitted to hospital on February 4, 1941. She had been perfectly well until seven weeks previously, when she had a feverish attack and was delirious; this condition lasted for two weeks. She recovered, but two weeks later she lost her appetite. One week later she suffered from a cough and croup, and pain in her legs had been present for one week before her admission to hospital.

On examination the child was seen to be pale and ill; her tongue was coated. The tonsils were present; no abnormality was detected in the abdomen. Scattered crepitations were heard at the base of the left lung. The heart appeared normal. Both wrists were swollen, tender and restricted in movement. Pain in the knees and hips developed. The child was pyrexial and looked very ill; she was sweating profusely and coughing. Sulphapyridine gave no relief, but sodium salicylate reduced both pain and fever. The patient was given a blood transfusion on March 6, and her condition improved greatly. A further blood transfusion was given on March 31 and the improvement continued.

On February 5 a blood count gave the following information: the erythrocytes numbered 3,250,000 and the leucocytes 11,300 per cubic millimetre, and the haemoglobin value was 50%. An X-ray examination of the chest suggested an area of atelectasis at the base of the left lung; the cardiac shadow was normal. The urine was normal. The blood sedimentation rate estimated on February 7 was 60 millimetres after one hour and 67 millimetres after two hours. A blood count on February 25 gave the following information: the erythrocytes numbered 2,740,000 and the leucocytes 8,600 per cubic millimetre, and the haemoglobin value was 38%. A further blood count on March 4 gave the following results: the erythrocytes numbered 3,610,000 and the leucocytes 10,500 per cubic millimetre, and the haemoglobin value was 40%. An X-ray examination of the long bones revealed the usual decalcification associated with rheumatoid arthritis. The Mantoux test produced no reaction. Salicylates and "M & B 693" were given, and the child received transfusions of blood. The limbs were splinted; the knees were kept slightly flexed and supported by back splints to prevent subluxation, and the wrists were placed in a slight "cock-up" position.

Dr. Taylor said that the two patients under discussion presented the typical picture of juvenile rheumatoid arthritis, a disease that was not very uncommon. The cases illustrated certain aspects of treatment. During the acute stage of fever and of joint pain and tenderness, salicylates were unquestionably the most useful drug. Sulphapyridine was probably of no use at all. When that stage was past, the parenteral administration of gold was often of real value. In the case of children, however, it had to be given carefully and in small doses, for they did not tolerate it so well as adults. The children under discussion had not yet been treated with gold. Splints had to be used to help maintain joint comfort and to minimize deformity. The response of the two children to blood transfusion was interesting and gratifying; it was probably the most effective single treatment given. Blood transfusion was proving a valuable stimulant in many conditions in childhood characterized by toxæmia and chronicity. The presence of cardiac impairment, however, as in chronic rheumatic carditis, contra-indicated its use.

Hypothyroidism.

Dr. Taylor then showed a girl, aged eight years, who had been admitted to hospital on February 13, 1941, from Moree; no history was available.

On examination the child was seen to be very pale, short, plump and thick-set; she was slow in speech, her voice was monotonous, and she appeared mentally backward. The abdomen was very protuberant and a small hernia was present. The skin was dry and the hair moderately coarse; the subcutaneous tissues were thick and firm. The eyebrows were sparse, but were present throughout their whole length. The child's height was three feet two and a half inches; normal height for her age was four feet six inches.

Various tests were carried out. The blood urea content was 48 milligrammes per centum. A blood count gave the following information: the erythrocytes numbered 3,400,000 and the leucocytes 10,800 per cubic millimetre; the haemoglobin value was 60%. An X-ray examination of the long bones revealed pronounced delay in the appearance of the ossific centres of the carpal bones and of the epiphyses of the metacarpals and phalanges, and also in the foot. The appearance of the ends of the long bones suggested that a rachitic lesion had been present at some previous time. An X-ray examination of the skull revealed no lesion.

The child was treated with thyroid extract, the dose being gradually increased from one-quarter of a grain to one and a half grains per day. At the time of the meeting she was much brighter mentally and not quite so thick set.

Dr. Taylor said the child's condition was a typical example of hypothyroidism, which might have been present from birth, and therefore classed as cretinism, or might have developed later and been regarded as myxedema. In the latter case the prognosis would be better. In cretinism some degree of mental retardation usually persisted, despite adequate treatment. In myxedema the prognosis depended on the age of onset and on the severity and duration of the disease before treatment was instituted. The essential treatment was administration of an effective thyroid preparation; small doses should be given at first, and an increase to the maximum tolerated dose should be made fairly quickly.

Tendon Transplantation.

DR. R. L. STEPHEN showed a boy, aged eight years, who had been admitted to hospital on January 13, 1941, with residual paralysis of the right leg and the right thumb from an attack of infantile paralysis three years previously. Examination revealed wasting of the right leg, especially of the *tibialis anterior*, and of the *opponens pollicis* of the right thumb.

At operation the *palmaris longus* was joined with sutures to the short extensors of the thumb and a plaster cast was applied. The patient attempted movements in the cast. When the cast was removed on January 30, the child was able to oppose the thumb and the little finger very well, and the function of the thumb was improved. The hand was very useful.

Dr. Stephen said that the treatment that had been given during the past three years consisted of splinting in a position of relaxation of the paralysed muscles, hydrotherapy and graduated active movements. As long as there was some flicker of movement in a muscle in the early stages of paralysis it could be expected that patient careful treatment along such lines would effect a considerable improvement in muscle power and perhaps even complete recovery. No final evaluation of muscle power and no question of tendon transplants should be thought of until at the very least a year had elapsed since the onset of paralysis. In the case under discussion three years had elapsed, and the

function of the *tibialis anterior* was still improving. It was strong enough to allow the child to walk without even a toe-raising spring, and would finally be an almost normal muscle.

Probable Myositis Ossificans.

Dr. Stephen then showed a boy, aged ten years, who had been referred to the orthopaedic department; he had sustained a supracondylar fracture of the left humerus one month previously. The limb had been treated in flexion. After two weeks the boy's medical attendant became worried because he could obtain no movement of the joint, and he attempted forcibly to extend it. A week later extension under anaesthesia was performed. These procedures, instead of increasing movement at the joint, decreased it, and the boy was referred to the hospital.

Examination revealed considerable thickening about the left elbow joint. It was held in a position of approximately a right angle, and a few degrees of flexion and extension could be obtained from that position. An X-ray examination revealed a small amount of calcification anterior to the lower end of the humerus, which might have been due to early *myositis ossificans* or possibly to callus.

The arm was simply put at rest in a collar and cuff sling, and each week was flexed a little more and kept in that position; care was taken, however, that on each occasion extension to the original position could be effected. In this manner a further 20° of flexion were obtained, and Dr. Stephen thought that this amount would gradually be increased. He said that the immediate treatment (fixation in flexion) was correct; but it was wrong to attempt forceful extension. This should have been achieved very gradually. The boy should have been persuaded to extend the elbow a few degrees every few days, and the sling should have been lengthened to keep the arm in the new position; on each occasion care should have been taken that no flexion was lost. Because flexion had been lost in this case by the early forced extension, the reverse process of gradually regaining flexion had to be adopted.

Extensive Paralysis of the Upper Limb.

Dr. KEITH SMITH showed a female patient, aged twelve years, who had suffered from weakness of the right shoulder girdle since early infancy. On examination, weakness and wasting of all the muscles of the scapula, shoulder girdle and arm and of the *opponens pollicis* were found. The muscles of the forearm were not quite so severely affected, and flexion and extension of the fingers were still less impaired.

Dr. Smith said that owing to the complete paralysis of the scapular muscles, arthrodesis of the shoulder joint would be of no value. At the elbow joint provision should be made to maintain continuous flexion at right angles. That position was better adapted for the usefulness of the limb, as the hand could be used in typing *et cetera*. Unfortunately the function of the limb had been further affected by loss of opposition due to paralysis of the *opponens pollicis*. It was proposed to transplant the *flexor sublimis digitorum* tendon of the right finger into the thumb metacarpal. Dr. Smith drew attention to the flexors of the forearm, which appeared to be completely paralysed when flexion of the forearm was attempted against gravity. When that factor was eliminated by the placing of the limb in the horizontal position, it was seen that the *brachialis anticus* was able to effect a full range of flexion. This was an added reason for placing that muscle in the position of anatomical rest, and recent return of power, as had occurred in this case, was an argument in favour of the belief that the power of recovery was permanently inherent in a paralysed muscle.

Fixation of the Inferior Angle of the Right Scapula.

Dr. Smith also showed a boy, aged seven years, who had been referred to the orthopaedic department in September, 1940, with the complaint that the right shoulder had been higher than the left since an attack of pneumonia when the child was aged two years. Examination revealed that the right shoulder was one and a half inches higher than the left, and the diameter of the right side of the thorax was half an inch greater than that of the left side; both sides, however, expanded evenly and well. The lower angle of the scapula was firmly fixed to the rib cage. In abduction of the arm the scapula rotated round a centre at its inferior angle. Despite this, elevation of the arm to the vertical position was well performed.

An X-ray examination revealed that the lungs were normal, that the cervical portion of the spine was normal, and that sclerosis and inequality of the third, fourth and fifth ribs on the right side were present, involving the lower end of the scapula. Chronic osteomyelitis or chronic osteitis due to syphilis or tuberculosis was considered to be

a possible cause. Neither the Mantoux test nor the Wassermann test produced a reaction.

Dr. Smith said that it was presumed that the cause of the fixation was fibrosis following low-grade osteomyelitis which complicated the attack of pneumonia five years earlier. The proposed treatment was operation to free the scapula. A *fascia lata* graft would be inserted.

Congenital Torticollis.

Dr. N. LITTLE showed a female patient, aged five years, who had had left-sided torticollis since birth. Examination revealed thickening and tightness of the left sterno-mastoid muscle. At operation on November 7, 1940, tenotomy of the clavicular head of the left sterno-mastoid muscle and of a few fibres of the sternal head was performed. Halter extension with six pounds' weight was applied to the neck. Two weeks later a torticollis cap was applied and the child was given massage and exercises. At the time of the meeting she had good voluntary over-correction.

Dr. Little remarked that the child had presented the typical picture of primary torticollis according to McMurray's classification. She had been treated by an open division of the clavicular head of the left sterno-mastoid muscle and of all other tight structures through a small incision over the inner end of the clavicle. After operation a weight of six pounds was applied to the head by means of a halter, and two weeks later a torticollis cap was fitted. Massage and stretching exercises were given three times a week. The cap was worn for eight weeks, and at the time of the meeting correction was good, but the facial asymmetry persisted and would continue in its present form; it would not, however, increase in amount. That fact was an argument in favour of treatment at the earliest possible stage. If these cases were diagnosed during the first few weeks of the patient's life, when the sterno-mastoid tumour was present, and if treatment was instituted at once, in most instances the child would have no apparent deformity.

Dr. Little then showed a female patient, aged six years, who had been admitted to hospital on November 6, 1940, with a history of left-sided torticollis, present since birth. Examination revealed wry neck with approximation of the occiput to the left shoulder. The whole of the left sterno-mastoid was thickened and tight.

At operation on November 11 tenotomy of both heads of the left sterno-mastoid and division of the deep fascia were performed. Halter extension was applied to the neck and later still a torticollis cap was used. The child was given exercises and massage. X-ray examination revealed slight malformation of the bodies of the first and second cervical vertebrae.

At the time of the meeting the clavicular head of the sterno-mastoid was still tight. Dr. Little remarked that the case illustrated the difficulty that could be encountered if any infection occurred in the wound after operation. The same procedure had been carried out as in the previous case; but a mild infection supervened in the wound, and in spite of vigorous after-treatment the sternal head of the sterno-mastoid muscle contracted again. A second operation had been performed only two weeks prior to the meeting, and the torticollis cap would be worn until there was no further chance that the muscle would contract. Although X-ray examination revealed slight malformation of the bodies of the first and second cervical vertebrae, the deformity could in no way affect the torticollis, because there was no wedging of the bodies, but only incomplete fusion of the spinous processes.

Congenital Dislocation of the Hip.

Dr. Little's next patient was a girl, aged two years and four months, who had been admitted to hospital on April 1, 1941. The mother had noticed that the child waddled from the time she began to walk. An X-ray examination revealed congenital dislocation of both hips; the acetabula were ill-formed and shallow.

An attempt at reduction of both hips under general anaesthesia was made; but there was so much tension from the soft tissues that the hips were allowed to become dislocated once more. The child was sent back to the ward and extension was applied to both limbs. Dr. Little remarked that as soon as the femoral capital epiphyses were opposite the triradiate cartilages, another attempt at reduction would be made and a plaster cast would be applied, with the legs in the "frog" position. If reduction was successful the cast would be changed as necessary until the upper portions of the acetabula moved forward. If at the end of fifteen months a "lip" had not grown and the femoral heads slipped out, the surgical formation of "lips" would be considered.

Dr. Little finally showed a female patient, aged four years, who had been admitted to hospital in June, 1937, with a history of a left-sided limp present since the child began

to walk at the age of eighteen months; the limp was becoming more noticeable. An X-ray examination revealed congenital dislocation of the left hip, with upward displacement of the femur. The acetabulum was very flat, and no shelf was present. Extension was applied for two weeks, followed by manipulation and the application of a plaster cast. An X-ray examination showed that the femoral heads were in good position. The child was treated in a plaster spica, and was finally discharged from hospital after fourteen months. She was able to walk without any apparatus.

An X-ray examination made on June 5, 1939, showed that the left femoral head was centrally placed in the acetabulum and that Nélaton's line was in its correct position. Some regeneration of the acetabular roof had occurred. A further X-ray examination on February 26, 1940, showed that some irregularity of the left femoral head and the acetabulum persisted. Shenton's line was correctly placed; the joint space was wide. At the time of the meeting the child walked and ran well; neither dip nor shortening was present. There was a good normal hip range and the musculature was good; the trochanter was slightly prominent.

Dr. Little remarked that although the last skiagram revealed some irregularity of the left femoral head and the acetabulum, the child had a perfect functional result. After examination of the original X-ray films it was considered doubtful whether the upper lip of the acetabulum would regenerate; but at the end of twelve months' treatment by means of a plaster cast, a good deep acetabulum had formed. Dr. Little pointed out that this fact bore out the dictum that the presence of the femoral head in the acetabular cavity was necessary for the latter's proper formation. After removal of the plaster cast hip movements recovered quickly, and at the time of the meeting the child walked, ran and stood as any normal child. The possibility of the development of osteoarthritis later in life had to be kept in mind in all cases in which roughening of the acetabulum or of the femoral head had occurred.

Lung Abscess.

DR. R. A. R. GREEN showed a boy, aged seven years, who had been admitted to the Royal Alexandra Hospital for Children from another hospital with a history of cough and pneumonia, present since the child had undergone an operation for tonsillectomy in July, 1940. He had had intermittent pyrexia until December 12, 1940. On December 30 the patient produced offensive sputum containing pus, and his respiration rate was 26 per minute.

When he was examined on his admission to hospital, on January 8, 1941, the child looked as if he were suffering from a severe infection. An area of dullness was present over the lower part of the upper and middle lobes of the right lung posteriorly. The breath sounds were audible only at the apex and posteriorly.

The patient had periods of fever in which the temperature rose to 103° F.; the sputum was profuse. Then for periods of several days he was afebrile. These conditions alternated until March 4. From that time until March 22 the patient clinically was very well, and was allowed to go home to rest. He was readmitted to hospital on March 31, having had an hæmoptysis; his temperature was 103° F., and he was producing profuse sputum and vomiting pus. On April 9 it was learned that two teeth had been lost during the tonsillectomy operation performed in July, 1940, and a bronchoscopic examination was decided upon.

The radiological reports were obtained from the hospital at which the patient had had his tonsils removed. The first X-ray examination was made on November 11, 1940, and revealed unresolved pneumonia in the upper lobe of the right lung, with involvement of the middle lobe. Resolution had not occurred, and excavation to form multiple small abscesses had begun in the affected lung area. A further X-ray examination on November 22 revealed considerable opacity in the upper lobe of the right lung; it was, however, less extensive than before, and was thought to be clearing up. On December 5 another radiological examination was made, which revealed that the condition had deteriorated since the previous examination. Around the area of translucency there was a suggestion of pulmonary abscess just below the right clavicle; an area of dense opacity was also present in the middle zone of the lung. The latter was thought to be due to a collection of fluid between the upper lobes of the lung. A fourth X-ray examination was made on December 10, which revealed multiple abscesses or a loculated abscess in the upper portion of the right lung; these were draining into the bronchus, and the abscess cavities were practically empty.

A number of radiological examinations were made at the Royal Alexandra Hospital for Children. The first, on January 8, 1941, revealed diffuse consolidation and a fluid-containing cavity; this was considered to be an active lung abscess. The second X-ray examination, made on February 5,

showed that the consolidation was less; an abscess cavity with a fluid level was still visible, but smaller. The interlobar effusion in the longitudinal fissure had been absorbed. The condition was reported as improved, but not healed. On February 19 a third X-ray examination revealed that the abscess lay posteriorly in the base of the upper lobe. A further examination on March 11 revealed that slight improvement had taken place since the previous examination, but pronounced consolidation and cavitation were still present. Finally, an X-ray examination made on April 1 revealed gross consolidation in the middle portion of the lower lobe of the lung; pneumonitis was present, possibly with a small effusion. The appearances indicated much deterioration since the previous examination. Examination of the sputum for tubercle bacilli gave negative results.

Dr. Green said that the interest of the case lay in the long-continued lung infection associated with but little deterioration in the patient's general condition, in spite of the pyrexial attacks. The recently obtained information that two teeth had been lost during the tonsillectomy operation offered some hope that these might be found by the bronchoscopic examination, which was to be made within a few days. If no foreign body was found, repeated bronchoscopic drainage might allow the cavity to close and become fibrosed.

(To be continued.)

Post-Graduate Work.

COURSE IN ELECTROCARDIOGRAPHY AT SYDNEY.

THE New South Wales Post-Graduate Committee in Medicine announces that a week-end course in electrocardiography will be conducted at the Prince Henry Hospital on June 21 and 22, 1941, by the Director of the Post-Graduate Medical Unit, Dr. S. A. Smith. The course will be of an elementary nature and suited to those who have had no previous experience. It will include the study of the principles of electrocardiography, the normal electrocardiogram, the common arrhythmias, the electrocardiogram in coronary disease and consideration of the clinical value of the electrocardiogram. The course will be held on the afternoon of Saturday, June 21, beginning at 2 o'clock, and on the morning of Sunday, June 22, beginning at 9.30 o'clock.

The fee for the course is two guineas, except for medical officers of the defence forces on full-time service, who are invited to attend the whole or any part of the course free of charge. Applications for registration, accompanied by a remittance for the amount of the fee, must be made to the Secretary, New South Wales Post-Graduate Committee in Medicine, the Prince Henry Hospital, Little Bay.

NOTICE.

THE next clinico-pathological conference arranged by the Post-Graduate Directors of Medicine, Surgery and Pathology will be held in the lecture hall at the Prince Henry Hospital, Little Bay, New South Wales, on Monday, May 26, 1941, at 4.30 p.m. The subjects will be: Cases for diagnosis and discussion: (a) a case with pulmonary symptoms, (b) a case of jaundice, (c) a case for diagnosis. A cordial invitation to be present at the meeting is extended to all medical practitioners.

Naval, Military and Air Force.

APPOINTMENTS.

THE undermentioned appointments, changes *et cetera* have been promulgated in the *Commonwealth of Australia Gazette*, Number 90, of May 8, 1941.

AUSTRALIAN MILITARY FORCES. AUSTRALIAN ARMY MEDICAL CORPS. Northern Command. Eighth Military District.

Honorary Captain C. E. M. Gunther is appointed from the Reserve of Officers (A.A.M.C.), 2nd Military District, and to be Captain (provisionally), 28th March, 1941.

Eastern Command.**Second Military District.**

Honorary Captain L. A. Harlock is appointed from the Reserve of Officers (A.A.M.C.), and to be Captain (provisionally), 17th February, 1941; Captain (provisionally) I. W. Holt is transferred from Australian Army Medical Corps, 6th Military District, 26th August, 1940; the notification respecting Captain (Temporary Lieutenant-Colonel) W. Wood which appeared in Executive Minute No. 43/1941, promulgated in *Commonwealth Gazette* No. 36 of 1941, is amended by altering the date shown therein from 1st January, 1941, to 16th December, 1940.

Reserve of Officers.—Lieutenant J. N. Sevier is transferred from the Reserve of Officers (Inf.), and to be Honorary Captain, 6th March, 1941. *To be Honorary Captains*—Arthur Raymond Lewis, David Robertson Reid, Percy Hugh Doyle, 17th March, 1941; Terence Keith Smyth Whiting, Gerald Fitzgerald, David Bruce Arnott, Otto Henry Schneider, 18th March, 1941; Ross Alexander James McGregor, Richard Daniel Condon, Thomas William Miles and Walter Stafford McGrath, 19th March, 1941.

Southern Command.**Third Military District.**

The following officers are appointed from the Reserve of Officers (A.A.M.C.) on the respective dates shown and to be Captains (provisionally): Honorary Captains A. J. Macdonald, 11th February, 1941; N. A. Longden, 18th February, 1941; J. McF. Pone, 21st February, 1941; J. A. R. Joyce, 3rd March, 1941; and W. E. Macmillan, 6th March, 1941. The name Captain G. H. Dallimore, appearing in Executive Minute No. 44/1941, promulgated in *Commonwealth Gazette* No. 36 of 1941, is amended to read Captain G. M. Dallimore.

Reserve of Officers.—The notification respecting the promotion to Honorary Captain of Honorary Lieutenant J. H. Lane, which appeared in Executive Minute No. 95/1940, promulgated in *Commonwealth Gazette* No. 88 of 1940, is cancelled. *To be Honorary Captain*—Thomas Powell Dawes, 18th March, 1941.

Fourth Military District.

Reserve of Officers.—*To be Honorary Captain*—Leigh Stuart Wallman, 18th March, 1941.

Sixth Military District.

The provisional appointment of Lieutenant R. O. Lyons is confirmed.

Reserve of Officers.—*To be Honorary Captain*—Alan Pryde, 6th February, 1941.

Western Command.**Fifth Military District.**

To be Captain (provisionally)—Alec Siglin, 5th March, 1941.

Reserve of Officers.—Michael Salvaris, 14th March, 1941, and Kenneth Laurence Brooke-Cowden, 17th March, 1941.

Seventh Military District.

Lieutenant Colonel A. E. M. Moir, from command of a Field Ambulance, 2nd Military District, is appointed to command a General Hospital, 1st March, 1941.

ROYAL AUSTRALIAN AIR FORCE.**Citizen Air Force: Medical Branch.**

Flight Lieutenant J. F. Hughes is transferred from the Reserve to the Active List, with effect from 17th April, 1941.

Upon completion of No. 7 Administrative and Special Duties Course, the seniority of the following officers has been determined by ranks in the order shown: Pilot Officers D. P. Felton and C. O. Duffy.—(Ex. Min. No. 58—Approved 7th May, 1941.)

Flight Lieutenant J. Deane-Butcher is transferred from the Reserve to the Active List, with effect from 31st March, 1941.

The following is granted a commission on probation with the rank of Flight Lieutenant, with effect from 31st March, 1941: William George Galley, M.B., B.S.

Reserve: Medical Branch.

William Arthur Rushbrook Smith, M.B., B.S., is granted a commission on probation with the rank of Flight Lieutenant, with effect from 30th March, 1941.—(Ex. Min. No. 57—Approved 7th May, 1941.)

Correspondence.**INSULIN AND "CARDIAZOL" IN THE TREATMENT OF THE PSYCHOSES.**

SIR: I most heartily endorse the remarks of your contributor R. Ramsay Webb when he referred to the unfortunate suggestion that insulin shock therapy should be abandoned for the duration of the war. I can only regard such a suggestion as being the "fruit of ignorance".

Psychiatry has for too long been the "Cinderella" of medicine, and while it is impossible to deny that much unscientific nonsense has found its way into the mental journals, this is not yet as great as the amount of unscientific criticism which has been levelled at it by ignorant and inexperienced commentators. At a time when the forces of destruction are paramount, let us not deny to medicine that wonderful recent constructive advance which is second only in magnitude to those discoveries which have taken place in the field of chemotherapy.

With regard to the content of the Beattie-Smith Lectures, one is struck especially by the practical competence of the lecturer. There are, however, several features of the treatment which call for criticism.

Firstly, there is the question of dosage. In this, I am sure, lies the secret of the large number of "irreversible comas" which are occurring at Mont Park—over 10%, as compared with the 2% of other reports! In my experience "irreversible coma" is a rare occurrence. The method of dosage employed by myself and by the psychiatrists I have seen using this therapy is to give 20 units on the first day and raise this by 20 units daily until hypoglycæmic symptoms appear; subsequently the daily increase is 10 units, and this continues until "sopor" (disorientated, confused stage) is reached, after which an increase of five units each day will bring "coma" to the required depth and will bring its onset to the required time.

Sakel, in his book "Pharmacological Shock Treatment of Schizophrenia", mentions 90 units as a representative dose for the ninth day, as compared with Webb's 180 units. The high and rapid dosage results in a state of affairs where an original coma dose of 400 units has to be reduced to 150. Such so-called "insulin sensitivity" is too considerable to be accounted for by that phenomenon alone, and would, I am certain, not have occurred with more moderate increases than those used by the contributor.

Another important factor in the production of the "irreversible coma" is the length of time for which the patient is allowed to stay in "coma". Most therapists regard one and a half hours from the onset of "sopor" or half an hour from the onset of "coma" as being the maximum necessary for safety. I personally consider one hour as being safe in cases which are not showing signs of excessive depth, and this time should be gradually attained through successive comas, starting with an initial duration of five minutes.

Important signs in the prevention of the "irreversible coma" are: (i) early onset of coma, (ii) undue length of time taken to "come out" from coma. Here I would mention a criticism of the excessive usage of intravenous and intramuscular glucose administration in masking the latter phenomenon and so destroying this valuable sign of impending "irreversibility".

Secondly, and this is bound up with the excessive use of intravenous and intramuscular glucose, is the amazing statement that "bolls" are particularly common. I have never seen it mentioned anywhere in the literature and have not come across this complication in any of the cases I have treated or seen either here or in England. There is little doubt in my mind that the abundant parenteral administration of sugar is the cause, as "bolls" and septic conditions are features of the hyperglycæmic states which occur in *diabetes mellitus*.

Webb informs us that the tendency at Mont Park is to use this method more and more. For the two important reasons I have outlined I consider its use should be confined to the treatment of complications.

I would quote Sakel again on this subject: "I now use the nasal tube almost exclusively to terminate shock if the patient is in no immediate danger . . . Tube feedings have for many reasons proved their value and have become routine procedure. Intravenous glucose injections are given only when sudden threatening respiratory or cardio-vascular emergencies arise or for special therapeutic indications to be later described."

Besides producing an increased number of "irreversible comas", other complications also appear to be increased. For economic reasons it is wiser to use smaller dosage, as less material is needed to deal with the smaller number

of complications and the drain on the nursing staff is much less.

There are several other smaller points which I would like to make. In interrupting a coma, it is uneconomical to use large doses of glucose where small injections of insulin have been given, and for this reason a standard amount of glucose per feed is undesirable.

In Sakel's clinic the interruption dose is calculated by giving as many grammes of sugar as units of insulin, together with an additional 10% of sugar made up with a 40% solution.

An interesting pathological point, which is mentioned, is that only when the blood sugar is restored to normal levels do the dangerous symptoms of "irreversible coma" occur. I would point out that the reason for this is that cells which have been damaged by the hypoglycemia are suddenly stimulated by sugar and the attempt to restore their normal metabolism results in disordered and irregular responses in the various parts of the nervous system.

As for "Cardiazol", I cannot agree with the complacent way spinal fractures are treated. The seriousness of this condition cannot be minimized and all fractures should be treated adequately even if only 2% are going to develop Kummel's disease. The only possible contraindication of this is an untoward effect on the mental condition. It is too early to assess adequately the remote effects of these injuries and it is unfair not to take all precautions to prevent vertebral rarefaction and collapse. The number of people who are going to develop spinal fractures in ten years is going to be quite considerable, if, as has been shown by some investigators, from 25% to 45% of patients suffer them.

The great disadvantages of "Triazol" ("Azoman") I have found, are, firstly, the difficulty in controlling dosage so that multiple fits occur, and secondly, the frequent occurrence of "twilight states" with their associated excitements and furors.

So far as the results are concerned, there are several points which require elucidation. There is no attempt made to differentiate schizoid states from frank schizophrenia. It is important in assessing results to know if this is being done. It is my practice to wait for a while after admission to see if any signs of spontaneous improvement appear, unless there are absolute and direct indications for one of the special forms of treatment. The period of waiting does not prejudice the patient's prospect of recovery, and by excluding likely cases of spontaneous remission helps to give a more accurate indication of the value of the treatment.

There is no doubt that "Cardiazol" is of value in shortening the duration of attacks of melancholia, but I cannot accept the statement that: "Before the advent of 'Cardiazol' these cases (Involuntary melancholia) had the worst prognosis of all." The spontaneous recovery rate is estimated as being from 40% to 60%, which is very much higher than the recoveries from schizophrenia.

"Cardiazol" is of no value whatsoever in cases exhibiting dysymbole and this point should be emphasized. Insulin is the only method of treatment which will affect these cases and even then the prognosis is not good.

I would like to stress the very excellent way in which the importance of psychotherapy is made apparent; the value of digital pressure in preserving veins after injection; the usefulness of the original work with intramuscular 15% glucose; and the interesting method for controlling restlessness.

There are several minor statements which I could criticize, but I will not do so because I feel they will tend to give a wrong impression and cloud the main issue, namely, that too rapid dosage of insulin is occurring and too much parental administration of glucose is taking place. The criticism which I offer here is, I hope, constructive in character and, as such, of value. There is no doubt that R. Ramsay Webb is a very competent and stimulating worker with ideas and the initiative to carry them out. He has presented the case for an adequate recognition of modern psychiatric therapy in no uncertain fashion, and in doing so has rendered a service to all psychiatrists in Australia.

Yours, etc.,

ALAN STOLLER,

Acting Medical Superintendent,
Claremont Mental Hospital.

Claremont,
Western Australia,
April 29, 1941.

MEDICAL SOCIOLOGY.

Sir: The admirable "Plan for Racial Health" outlined by Dr. Stanley Boyd in the journal of March 8, and the comprehensive address by Dr. Wilfred Vickers reported in your issue of April 26, should be considered together. In

each address great stress is laid on the importance of preventive medicine. In each address we are urged to think of the next generation.

Lord Horder, when he visited Australia during the annual meeting of the British Medical Association in 1935, chose as his public lecture the subject "Eugenics", which is defined as "the study of agencies under social control which may improve or impair the racial qualities of future generations, either physically or mentally". Lord Horder expressed his conviction that eugenics is the most important branch of preventive medicine, and that the application of eugenic principles will add greatly to the welfare and happiness of the human race. The Eugenics Society of England, of which Lord Horder is president, is actively supported by a great number of the prominent men of our profession as well as by scientists of the calibre of Julian Huxley and Carr-Saunders.

The *Eugenics Review*, a quarterly journal published by the English Society, contains articles on population problems, child endowment, unemployment, welfare work, housing, intelligence tests, contraception, genetics and kindred subjects. I shall be pleased to send a copy of this review to any reader who is sufficiently interested to ask for one.

As a profession we have not paid enough attention to preventive medicine. Both hereditary and environmental causes of national unfitness must be eliminated. We must not accept as inevitable such blots on our civilization as mental deficiency, malnutrition, squalid slums and social injustice.

I believe that medical men as a class have higher ideals than the average man. Most of us at some time or another have shared the thoughts of Omar Khayyám:

Could you and I with Fate conspire
To grasp this sorry Scheme of Things entire,
Would not we shatter it to bits,—and then
Re-mould it nearer to the Heart's Desire!

Well! Here we are, with cities and ships and the standards of the old order being shattered to bits. Sooner or later the period of reconstruction must come. We should carefully think out our plans now if we are going to remould human affairs nearer to the heart's desire. The medical profession is in a position to give immense assistance to the powers that will be in the work of reconstruction. In this great duty we must not fail.

Yours, etc.,

V. H. WALLACE,

Honorary Secretary,

Eugenics Society of Victoria.

61, Collins Street,
Melbourne, C.I.,
May 2, 1941.

REPORT ON CEREBRO-SPINAL MENINGITIS.

Sir: A report by Lieutenant-Colonel M. J. Holmes, D.S.O., on cerebro-spinal meningitis is very similar to other reports on the same subject that have appeared elsewhere. The arrangements to prevent overcrowding are exceedingly thorough, but it has yet to be shown that overcrowding in the camp is the means of spreading the disease.

In the English epidemic I took part in hunting for carriers and tracking down the spread of the disease, and one case which impressed itself most strongly on my mind was this: Two Canadian soldiers were billeted with an old lady, the mother of a young girl in the early twenties. The father was dead, but a grandfather lived in the house. I was called to the young girl, who was amongst the earliest cases in the meningitis epidemic, and she informed me that she was engaged to one of the Canadian soldiers in the house, and naturally she had kissed him. I therefore concluded that she had been infected by him. The other Canadian soldier, to whom she was not engaged, followed her as a case of meningitis, and I then asked him whether he had been accustomed to kiss the girl as well as the man who was engaged to her. He admitted that he had. The girl kissed her mother, and she subsequently developed the disease. The grandfather was not kissed by anyone in the house, and he never contracted the disease.

I therefore believe that all this overcrowding is an unproved factor in the spread of meningitis.

We are told that the floorboards are moved periodically into the sunlight and the tent sides are turned up to give the sun direct access to the space beneath the tents. Huts are thrown open and washed out with disinfectant. This action in the direction of cleanliness is all to the good, but as far as I am concerned I should like to have some proof of its value in preventing the spread of the disease.

Contact infections in the same hut are extremely rare, which should not be the case if overcrowding were the cause.

In my view, the young recruits who go into camp amuse themselves by kissing women around the camp. Consequently the frequency of the disease shoots up. We have other diseases of a contagious nature which spread in camps in a similar way, but we know that they are spread by contact with women outside the camp.

I know that an inquiry into this practice of kissing would probably be difficult because of untruth and unwillingness on the part of the men to admit it; but I would recommend Lieutenant-Colonel Holmes to start an inquiry along these lines. We may be surprised at the relative truthfulness of many men who would not be ashamed of kissing strange women outside the camp.

The promiscuous kissing of babies should be absolutely prohibited, especially during any epidemic of cerebro-spinal meningitis.

In the big English epidemic it was observed that when the recruits went to sea in small ships, that is, when they were thoroughly overcrowded, the epidemic did not flare up.

To me, therefore, cerebro-spinal meningitis must be regarded as a venereal disease, and its mode of spread in the camp will not be dissimilar to that of the other venereal diseases.

The outbreak of meningitis on the formation of a camp is readily explained on this basis, and attacking it by separating the men from one another is, to my mind, so much waste.

Yours, etc.,

WILLIAM JAS. PENFOLD,

Consultant Bacteriologist to the
Baker Institute, Alfred Hospital,
Melbourne.

53, Prospect Hill Road,
Camberwell, E.6,
Victoria.

May 8, 1941.

MODERN ASPECTS OF PUERPERAL SEPSIS.

SIR: The paper of Dr. A. M. Hill (May 3) well deserves all the praise it got; but he surprises me that he should say that it is only today "we regard puerperal sepsis as a wound infection". The wound is therefore subject to ordinary wound infection of the common kind and also to that special kind, a virulent infection from a previous case. This kind is culpable; it should never be allowed to occur. The commonest source ascribed is naso-pharyngeal and so a strong appeal is made for the use of efficient masking. There are some who think, as I do, that a reliable mask for midwifery work has yet to be designed. It is time to ask why droplet infection has become such a menace during the later years. It was never thus; witness the records of Collins while master of the Rotunda, quoted by Dr. J. S. Green. Then wound infection was not rife as it is now, but discrete. Bad as it was in individual cases, suppuration was not encouraged, as it is now. Sporadic and flaming epidemics did arise then in hospitals, as they do now (compare the instance related by Dr. F. V. Scholes), all instances of case-to-case infection; but today is added contamination of the air of wards and operating theatres and fomites and, of course, throats. Logically, prevention should begin with the control of general sepsis, now unduly prevalent, as is here logically proved, and for cure by prevention all we want are minds logically inclined. Then, perhaps, masks will be superfluous, and I am sure everybody will be glad.

Yours, etc.,

Brisbane,
May 6, 1941.

A. C. F. HALFORD.

University Intelligence.

THE UNIVERSITY OF SYDNEY.

At the last meeting of the Senate of the University of Sydney the title of Emeritus Professor was conferred upon Professor E. R. Holme, who has retired from the McCaughey Chair of English Language, and on Professor J. C. Windeyer, who has retired from the Chair of Obstetrics.

The Trustees of the McGarvie Smith Institute have donated the sum of £9,000 for financial assistance for the Department of Veterinary Science. This money will be used both locally and at the Animal Husbandry Farm near St. Mary's.

Dr. Andrew Arthur Abbie, Senior Lecturer in Anatomy, has qualified for the degree of Doctor of Science. The title

of his thesis is "The Origin of the Corpus Callosum and the Fate of the Structures Related to it". One of the examiners was Professor Kappers, a distinguished anatomist of the Institute of Brain Research, Amsterdam.

THE MEDICAL WAR RELIEF FUND.

THE following is a fourth list of contributions to the Medical War Relief Fund established by the Federal Council of the British Medical Association in Australia for the relief of distressed medical practitioners in Great Britain.

New South Wales.

- £26 5s.: Dr. George Bell.
£25: Dr. G. C. Willcocks.
£10 10s.: Dr. W. B. Kerr, Dr. J. J. Gilchrist and Dr. Holland, Dr. Mulhearn, Dr. Wilson, Dr. Woodward and Dr. Jones.
£10: Dr. F. J. Howell.
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South Australia.

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Western Australia.

- £2 2s.: Dr. J. A. R. Mitchell and Dr. K. L. Brooke-Cowden, Dr. F. Gill, Dr. H. J. Gray.
£1 1s.: Dr. H. G. D. Breidahl and Dr. D. Wilson (weekly contribution), Dr. B. W. Buttsworth.

Obituary.

ZELMAN SCHWARTZ.

We are indebted to Dr. H. Boyd Graham for the following appreciation of the late Dr. Zelman Schwartz.

With the death of Dr. Zelman Schwartz, who was killed in action recently in the Middle East, a very promising career was cut short. He had become established as an ophthalmic surgeon in Collins Street, Melbourne, and was serving in that capacity with an Australian General Hospital.

He was educated at Wesley College under Adamson, and graduated from the medical course at the University of Melbourne in 1920. Pursuing his studies abroad, Schwartz

obtained the Fellowship of the Royal College of Surgeons of Edinburgh and studied his specialty at Moorfields and later gained further experience in India.

When he returned to Melbourne, Schwartz became an assistant to the honorary ophthalmic surgeon at the Royal Melbourne Hospital, in which position he rendered notable service until he left it to join the Australian Army Medical Corps for active service abroad. At the same time he practised his specialty privately and was on the staff of the Medical Eye Service of Victoria for the benefit of those people who could afford only intermediate rates.

Major Schwartz was a thoroughly well-educated man, and his many friends recognized the profundity of his knowledge of classical and historical matters. He was a great reader and had a very good memory. He was also particularly interested in family affairs and had a very happy home life. We sympathize deeply and sincerely with his widow and two little daughters.

STEWART IRVINE WEIR.

We regret to announce the death on active service of Captain Stewart Irvine Weir, of the Australian Army Medical Corps.

JOHN COLIN RAMSAY JOYCE.

We regret to announce the death on active service of Captain John Colin Ramsay Joyce, of the Australian Army Medical Corps.

JOHN KILDAHL RICHARDS.

We regret to announce the death of Dr. John Kildahl Richards, which occurred on May 12, 1941, at Ballarat, Victoria.

ALLAN DOUGLAS GILLIES.

We regret to announce the death of Dr. Allan Douglas Gillies, which occurred on May 18, 1941, at Sydney, New South Wales.

Nominations and Elections.

THE undermentioned have applied for election as members of the South Australian Branch of the British Medical Association:

- Dorman, John Ernest, M.B., B.S., 1940 (Univ. Adelaide), Port Pirie.
Kennedy, Josephine Margaret, M.B., B.S., 1939 (Univ. Adelaide), 58, King William Road, Hyde Park.
Ackland-Horman, William Dunwoodie, M.B., B.S., 1941 (Univ. Adelaide), Royal Adelaide Hospital, Adelaide.

Books Received.

"Diet and Nutrition: A Synopsis for Nurses and Students of Dietetics", by V. L. Collins, M.D., D.C.H.; Second Edition; 1941. Melbourne: W. Ramsay (Surgical) Proprietary Limited. Demy 8vo, pp. 44. Price: 2s. net.

"Bainbridge and Menzies' Essentials of Physiology", edited and revised by H. Hartridge, M.A., M.D., Sc.D., M.R.C.P. F.R.S.; Ninth Edition; 1940. London: Longmans, Green and Company. Demy 8vo, pp. 661, with illustrations. Price: 16s. net.

"Cerebrospinal Fever", by D. Brinton, D.M., F.R.C.P.; 1941. Edinburgh: E. and S. Livingstone. Demy 8vo, pp. 170, with four photographs. Price: 8s. 6d. net.

"Practical Public Health Problems", by Sir William Savage, B.Sc., M.D.; 1941. London: J. and A. Churchill Limited. Large crown 8vo, pp. 205, with three diagrams. Price: 10s. 6d. net.

"A Short Textbook of Midwifery", by G. F. Gibberd, M.B., M.S., F.R.C.S., F.R.C.O.G.; Second Edition; 1941. London: J. and A. Churchill Limited. Demy 8vo, pp. 556, with 194 illustrations. Price: 18s. net.

"Weight Reduction, Diet and Dishes", by E. E. Claxton, M.B., B.S., D.T.M. & H., recipes by L. Burdekin; Second Edition; 1941. London: William Heinemann (Medical Books) Limited. Demy 8vo, pp. 210. Price: 8s. 6d. net.

Diary for the Month.

- MAY 27.—New South Wales Branch, B.M.A.: Medical Politics Committee.
MAY 28.—Victorian Branch, B.M.A.: Council.
MAY 29.—New South Wales Branch, B.M.A.: Branch.
MAY 29.—South Australian Branch, B.M.A.: Branch.
MAY 30.—Queensland Branch, B.M.A.: Commencement of Post-Graduate Course.
MAY 30.—Tasmanian Branch, B.M.A.: Council.
JUNE 3.—New South Wales Branch, B.M.A.: Organization and Science Committee.
JUNE 4.—Victorian Branch, B.M.A.: Branch.
JUNE 4.—Western Australian Branch, B.M.A.: Council.
JUNE 5.—South Australian Branch, B.M.A.: Council.
JUNE 6.—Queensland Branch, B.M.A.: Branch—Joseph Bancroft Memorial Lecture.
JUNE 6.—Victorian Branch, B.M.A.: Legislation Subcommittee.
JUNE 10.—Tasmanian Branch, B.M.A.: Branch.
JUNE 10.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
JUNE 12.—Victorian Branch, B.M.A.: Ethics Subcommittee.
JUNE 13.—Queensland Branch, B.M.A.: Council.
JUNE 16.—Victorian Branch, B.M.A.: Hospital Subcommittee.
JUNE 17.—Victorian Branch, B.M.A.: Organization Subcommittee.
JUNE 17.—Victorian Branch, B.M.A.: Finance, House and Library Subcommittee.
JUNE 17.—New South Wales Branch, B.M.A.: Ethics Committee.
JUNE 18.—Western Australian Branch, B.M.A.: Branch.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Honorary Secretary, 135, Macquarie Street, Sydney): Australian Natives' Association; Ashfield and District United Friendly Societies' Dispensary; Balmain United Friendly Societies' Dispensary; Leichhardt and Petersham United Friendly Societies' Dispensary; Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney; North Sydney Friendly Societies' Dispensary Limited; People's Prudential Assurance Company Limited; Phoenix Mutual Provident Society.

Victorian Branch (Honorary Secretary, Medical Society Hall, East Melbourne): Associated Medical Services Limited; all Institutes or Medical Dispensaries; Australian Prudential Association, Proprietary, Limited; Federated Mutual Medical Benefit Society; Mutual National Provident Club; National Provident Association; Hospital or other appointments outside Victoria.

Queensland Branch (Honorary Secretary, B.M.A. House, 225, Wickham Terrace, Brisbane, B.17): Brisbane Associated Friendly Societies' Medical Institute; Bundaberg Medical Institute. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

South Australian Branch (Honorary Secretary, 178, North Terrace, Adelaide): All Lodge appointments in South Australia; all Contract Practice appointments in South Australia.

Western Australian Branch (Honorary Secretary, 205, Saint George's Terrace, Perth): Wiluna Hospital; all Contract Practice appointments in Western Australia.

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